

Precalculus
Logarithms, Equations & Inverse Models | 10-Topic Precalculus Bundle

10-topic bundle | 960 problems | Four activity formats

Included topics

The following pages list all 10 included resources in the suggested order, with a link to each product. Each resource retains its complete preview.

In every topic

Answer Bank Challenge	24 tasks
Grid Rounds	24 tasks
Match & Move	24 cards
Error Analysis & Strategy	24 tasks
Quick Answer Key and Full Worked Solutions	included
Teacher / Parent Use Guide and Terms of Use	included

Product previews

The following preview pages show the cover, all four activity formats, and worked examples for each included resource, in the listed order.

80 PDFs and 10 READMEs; 682 buyer PDF pages across the 10 products.

Preview pages are not included in the buyer page count. Check the list against resources you already own.

Sets & Steps

Math Practice & Worked Solutions

Precalculus

Included topics

10-topic bundle | 960 problems | Four activity formats

01 Converting Logarithmic and Exponential Forms

[View individual product and its full preview](#)

02 Evaluating Logarithms and Domains

[View individual product and its full preview](#)

03 Exponential and Logarithmic Inverse Models

[View individual product and its full preview](#)

04 Logarithmic Function Features

[View individual product and its full preview](#)

05 Logarithmic Transformations and Applications

[View individual product and its full preview](#)

06 Log Properties and Change of Base

[View individual product and its full preview](#)

07 Solving Exponential Equations

[View individual product and its full preview](#)

08 Solving Logarithmic Equations

[View individual product and its full preview](#)

09 Exponential and Logarithmic Inequalities

[View individual product and its full preview](#)

10 Linearizing Exponential Data

[View individual product and its full preview](#)

10 included resources | Complete resource previews follow this guide.

Published by Tusils LLC.

AP Precalculus
Converting Logarithmic and Exponential Forms

Converting Logarithmic and Exponential Forms | APPC-U02-P16

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
03	Match & Move	24 cards
04	Error Analysis & Strategy	24 tasks
05	Quick Answer Key	96 answers
06	Full Worked Solutions	96 solutions
07	Teacher / Parent Use Guide	included
08	Terms of Use & License	included

Topic focus

Across 96 tasks this topic asks for base role and equivalent equation, base role, role and appropriate representation, role and operation, role of N and role of y and corresponding operation.

8 PDFs and a README; 49 buyer pages.

AP Precalculus

Converting Logarithmic and Exponential Forms

Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

Recover the positive value represented by coordinate -3. Given: domain: base-10 logarithmic scale; payload: axis: $u = \log_{10}(x)$; coordinate: -3 _____ Bank label: _____	Determine the sign from the position of x relative to 1. Given: domain: $x > 1$; payload: expression: logarithm base 2 of x _____ Bank label: _____						
Record the exponent using logarithmic notation. Given: domain: base 3; payload: statement: $3^4 = 81$ _____ Bank label: _____	Find the multiplicative factor from A's original value to B's. Context/domain: base-2 logarithmic coordinate <table border="1" data-bbox="824 892 1472 955"> <tbody> <tr> <td>A</td> <td>-2</td> </tr> <tr> <td>B</td> <td>1</td> </tr> </tbody> </table> _____ Bank label: _____	A	-2	B	1		
A	-2						
B	1						
Describe the logarithmic coordinate of the smaller amount. Given: domain: relative multiplicative position; payload: factor per interval: 4; output ratio: $\frac{1}{4}$ _____ Bank label: _____	Identify k's role and express it without evaluation. Given: domain: known positive R; payload: relationship: $3^k = R$ _____ Bank label: _____						
Determine which side of exponent zero produces z. Given: domain: $z > 1$; payload: argument: z; base: e _____ Bank label: _____	Convert the marked coordinates to exact original-scale values. Context/domain: base-5 logarithmic scale <table border="1" data-bbox="824 1558 1472 1652"> <tbody> <tr> <td>P</td> <td>-0.5</td> </tr> <tr> <td>Q</td> <td>0</td> </tr> <tr> <td>R</td> <td>1.5</td> </tr> </tbody> </table> _____ Bank label: _____	P	-0.5	Q	0	R	1.5
P	-0.5						
Q	0						
R	1.5						

AP Precalculus

Converting Logarithmic and Exponential Forms

Name: _____ Date: _____ Class: _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Represent and explain the number of multiplicative intervals. Given: domain: successive equal intervals; payload: factor per interval: 3; output ratio: 27 	Describe the unknown without evaluating it. Given: domain: positive quantities; payload: question: In $\log_5(18)$, what quantity is being requested?
Interpret the logarithm of the ratio, including why its sign is allowed. Given: domain: relative to a present amount; payload: earlier to present ratio: $\frac{1}{25}$; growth factor: 5 	State which part of an exponential relationship is unknown. Given: domain: positive quantities; payload: question: How many factors of 6 turn 1 into 50?
Express what the exponent counts in this growth situation. Given: domain: equal growth intervals; payload: factor per interval: 2; final to initial ratio: 8 	Identify the unknown role and express it without evaluating. Given: domain: positive quantities; payload: relationship: $7^x = 30$

AP Precalculus

Converting Logarithmic and Exponential Forms

Name: _____ Date: _____ Class: _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START Rewrite the exponential fact using common logarithm notation. Given: domain: common logarithm notation; payload: statement: $10^{-2} = 0.01$ Your response: _____	Incoming: The result equals zero. Rewrite the relationship so the exponent is the subject. Given: domain: valid base b and positive r; payload: statement: $b^m = r$ Your response: _____
Incoming: $u = \ln(5)$. Describe the logarithmic interval count represented by the ratio. Given: domain: continuous growth assumption; payload: factor per interval: 2; output ratio: $\sqrt{2}$ Your response: _____	Incoming: $(\frac{1}{3})^{-3} = 27$. Describe what N and p represent in the equivalent exponential relationship. Given: domain: $N > 0$; payload: statement: $\log_2(N) = p$ Your response: _____
Incoming: The original quantity is multiplied by 49. Decide whether a logarithm or exponentiation directly answers the stated question. Given: domain: positive N; payload: relationship: $2^5 = N$ Your response: _____	Incoming: $\log_5(\frac{1}{5}) = -1$. Display the exponent-zero relationship explicitly. Given: domain: base 7; payload: statement: $\log_7(1) = 0$ Your response: _____

AP Precalculus

Converting Logarithmic and Exponential Forms

Name: _____ Date: _____ Class: _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Diagnose the sign error and repair the statement.

Given: domain: real logarithms; payload: student claim: $\log_2(-8) = 3$ because $2^3 = 8$

Explain why $\log_3(20)$ would answer the wrong question.

Given: domain: positive b ; payload: relationship: $b^3 = 20$

Explain why no real logarithm value can satisfy the claim and give a nearby valid example.

Given: domain: real logarithms; payload: student claim: $\log_1(5)$ is some large exponent

Explain why the student's logarithm does not represent the unknown.

Given: domain: positive b ; payload: relationship: $b^3 = 12$; student expression: $\log_{12}(3)$

Converting Logarithmic and Exponential Forms

Full Worked Solutions - excerpt

Worked example

Problem. Identify the exponent that produces argument 1. Choose between using the base behavior and the argument position relative to 1, or approximating a decimal first. Determine the sign by the exact structural method.

Answer. The value is 0.

Explanation and check.

Any nonzero valid base raised to exponent 0 equals 1.

Worked example

Problem. Identify the original value located at coordinate $u = 2$.

Given: domain: base-10 logarithmic scale; payload: axis: $u = \log_{10}(x)$; coordinate: 2

Answer. $x = 100$.

Explanation and check.

Coordinate 2 means $10^2 = x$.

AP Precalculus
Evaluating Logarithms and Domains

Evaluating Logarithms and Domains | APPC-U02-P17

96 problems · Four activity formats

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Topic focus

Across 96 tasks this topic asks for domain, admissible x-values, corrected evaluation and verification, corrected exact value, corrected value with verification and correction.

8 PDFs and a README; 49 buyer pages.

AP Precalculus

Evaluating Logarithms
and Domains

Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

State the domain using the strict positivity of the argument. Given: domain: real x; payload: statement: $\ln(x + 5)$ _____ Bank label: _____	Find the exact logarithm by rewriting the argument as a power of the base. Given: domain: real logarithm; payload: statement: $\log_4(2)$ _____ Bank label: _____
Determine whether the value is available exactly and explain the common-base comparison. Given: domain: real logarithm; payload: statement: $\log_{16}(8)$ _____ Bank label: _____	Intersect the base and argument restrictions and remove the forbidden base value. Given: domain: real x; payload: statement: log base $(5-x)$ of $(x + 1)$ _____ Bank label: _____
Compare exponents after expressing both quantities as powers of 3. Given: domain: real logarithm; payload: statement: log base $(\frac{1}{3})$ of $\sqrt{27}$ _____ Bank label: _____	Decide whether a rational exponent is available exactly and state it. Given: domain: real logarithm; payload: statement: $\log_{81}(3)$ _____ Bank label: _____
Solve the strict positivity condition for the decreasing argument. Given: domain: real x; payload: statement: $\log(9 - 3x)$ _____ Bank label: _____	Intersect the base restrictions with the sign condition on the quadratic argument. Given: domain: real x; payload: statement: log base $(-x)$ of $(x^2 - 4)$ _____ Bank label: _____

AP Precalculus

Evaluating Logarithms
and Domains

Name: _____ Date: _____ Class: _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Determine the real domain, keeping the logarithm's boundary strict. Given: domain: real x; payload: statement: $\log(2x - 6)$ 	Use a sign chart for the entire logarithm argument. Given: domain: real x; payload: statement: $\ln((5-x)/(x+2))$
Evaluate and verify with one exponential equation. Given: domain: real logarithm; payload: statement: $\log_5(125)$ 	Determine where the rational argument is strictly positive, noting its repeated zero. Given: domain: real x; payload: statement: $\log\left(\frac{(x-2)^2}{x+1}\right)$
Build a sign chart and retain only intervals with a positive argument. Given: domain: real x; payload: statement: $\ln\left(\frac{(x+3)(x-1)}{x-4}\right)$ 	Combine the linear base and argument constraints, including the base-one exclusion. Given: domain: real x; payload: statement: log base $(2x + 1)$ of $(5-x)$

AP Precalculus

Evaluating Logarithms and Domains

Name: _____ Date: _____ Class: _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Diagnose the claim before doing any power calculation.

Given: domain: real logarithm; payload: claim: $\log_3(-9) = 2$

A student reports the logarithm as exactly $\frac{3}{2}$. Decide what the table actually supports.

Given: domain: rounded positive measurements; payload: argument measurement: 27.0; argument precision: nearest tenth; base measurement: 9.0; base precision: nearest hundredth

Repair the exponent after accounting for the reciprocal in the argument.

Given: domain: real logarithm; payload: claim: $\log_5\left(\frac{1}{25}\right) = 2$ because $5^2 = 25$

Identify both the sign mismatch in the cited power and the real-logarithm restriction that settles the claim.

Given: domain: real logarithm; payload: claim: log base -2 of $8 = 3$ because $(-2)^3 = -8$

Evaluating Logarithms and Domains

Full Worked Solutions - excerpt

Worked example

Problem. Combine the argument inequality with the value that makes the logarithmic denominator zero.

Given: domain: real x ; payload: statement: $1/\log_3(2-x)$

Answer. $x < 2$ with x not equal to 1

Explanation and check.

The argument requires $2-x > 0$, while $\log_3(2-x)=0$ at $2-x=1$, so $x=1$ is excluded.

Worked example

Problem. Require both logarithms to exist and neither denominator factor to be zero.

Given: domain: real x ; payload: statement: $1/(\ln(x+2) \ln(5-x))$

Answer. $-2 < x < 5$, excluding $x = -1$ and $x = 4$

Explanation and check.

Argument positivity gives $-2 < x < 5$; $\ln(x+2)=0$ at -1 and $\ln(5-x)=0$ at 4 .

AP Precalculus
Exponential and Logarithmic Inverse Models

Exponential and Logarithmic Inverse Models | APPC-U02-P18

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
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08	Terms of Use & License	included

Topic focus

Across 96 tasks this topic asks for adjusted inverse change, baseline-adjusted inverse change, baseline-adjusted inverse rule, inverse change, inverse multiplicative-additive rule and inverse rule.

8 PDFs and a README; 73 buyer pages.

AP Precalculus

Exponential and Logarithmic Inverse Models

Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Recover cycle number from remaining carbon and retain the discrete operating condition.

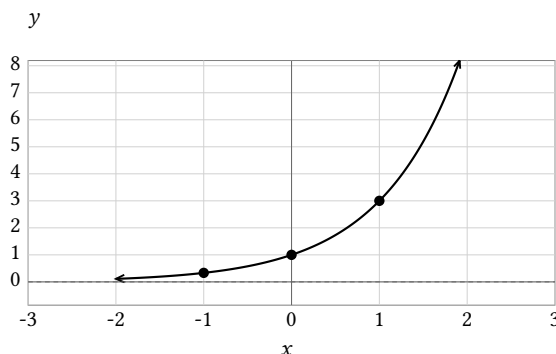
Your complete response must include inverse and physical inputs.

Use the condition whole-number cycles 0 through 10.

Use the model $Q(n) = 100(0.75)^n$.

Use cycles and grams as the stated units.

Reflect the marked graph across $y = x$.



-1	$\frac{1}{3}$
0	1
1	3

Bank label: _____

Bank label: _____

Undo the logarithm and both shifts.

Your complete response must include inverse.

Use the condition $x > -2$.

Consider the statement $g(x) = \log_5(x + 2) - 4$.

Recover treatment number from concentration and retain physical attainability.

Your complete response must include inverse and discrete condition.

Use the condition whole-number treatments 0 through 8.

Use the model $C(n) = 60(0.7)^n$.

Use treatments and milligrams per liter as the stated units.

Bank label: _____

Bank label: _____

AP Precalculus

Exponential and Logarithmic Inverse Models

Name: _____ Date: _____ Class: _____

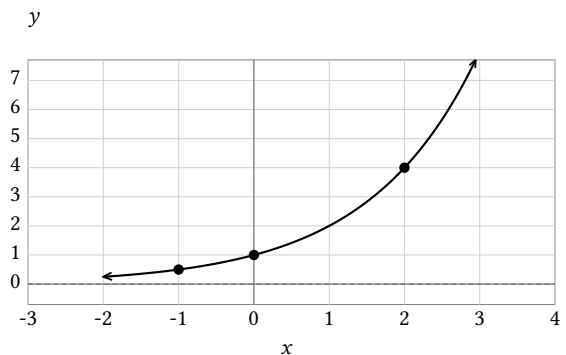
Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Swap the coordinates to construct the inverse logarithm table and name its rule.

Given domain/context: exact table from $y = 2^x$

-1	0.5
0	1
1	2

Reflect the marked graph features across $y = x$.



-1	0.5
0	1
2	4

Undo the output shift and scale before taking a logarithm.
Your complete response must include inverse formula and domain.
Use the condition all real inputs.
Consider the statement $f(x) = 2 \cdot 3^x + 1$.

Construct the exponential inverse and state its range.
Your complete response must include inverse formula and exchanged sets.
Use the condition $x > 1$.
Consider the statement $g(x) = \log_2(x - 1) + 3$.

AP Precalculus

Exponential and Logarithmic
Inverse Models

Name: _____ Date: _____ Class: _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: Inverse points $(6, 0)$, $(3, 1)$, and $(\frac{9}{4}, 2)$, with vertical asymptote $x = 2$ and domain $x > 2$. Recover the scale coordinate from intensity and transfer both operating endpoints. Your complete response must include inverse and attainable interval. Use the condition $-2 \leq s \leq 3$ scale units. Use the model $I(s) = 5 \cdot 10^s$. Use scale units and watts as the stated units. Your response: _____	Incoming: $s(I) = \log_{10}(\frac{I}{5})$, for $0.05 \leq I \leq 5000$ watts. Translate the forward multiplier into the inverse relation. Your complete response must include inverse change. Use the condition exact base-4 process. The forward rule states that input +1 multiplies output by 4. Your response: _____
Incoming: $t(A) = 2 \log_4(\frac{A}{20})$, for $20 \leq A \leq 1280$ square centimeters. Recover hours from mold area during the finite observation window. Your complete response must include inverse and domain. Use the condition $0 \leq h \leq 15$ hours. Use the model $A(h) = 4 \cdot 2^{\frac{h}{3}}$. Use hours and square centimeters as the stated units. Your response: _____	Incoming: $f^{-1}(x) = -2 + \log_3(\frac{8-x}{7})$, defined for $x < 8$. Normalize above the baseline before taking a logarithm. Your complete response must include inverse and domain. Use the condition all real inputs. Consider the statement $f(x) = 2 \cdot 6^x + 4$. Your response: _____
Incoming: $t(M) = 2 \log_3(\frac{M}{25})$, for $25 \leq M \leq 2025$ microbes. Recover elapsed time from the covered area. Your complete response must include inverse and attainable domain. Use the condition $0 \leq t \leq 6$ hours. Use the model $A(t) = 20 \cdot 4^{\frac{t}{2}}$. Use hours and square centimeters as the stated units. Your response: _____	Incoming: $g^{-1}(x) = 5 + 2^{4-x}$, with range $x > 5$. Recover time from a count over the stated experiment. Your complete response must include inverse and interval. Use the condition $0 \leq t \leq 8$ hours. Use the model $M(t) = 25 \cdot 3^{\frac{t}{2}}$. Use hours and microbes as the stated units. Your response: _____

AP Precalculus

Exponential and Logarithmic Inverse Models

Name: _____ Date: _____ Class: _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Test the proposed inverse and repair the shift. Identify the wrong shift in the proposed inverse and repair it. Verify your correction by composition.

Your complete response must include correction.

Use the condition real exponential inputs.

Let $f(x) = 2^{x+3}$.

The proposed inverse is $\log_2(x) + 3$.

Assess the formulas and the claimed inverse domain separately. Diagnose the claimed inverse domain separately from the two formulas.

Your complete response must include domain repair.

Use the condition real exponential inputs.

Evaluate the claim g has domain $x > 0$.

Let $f(x) = 2^x + 1$.

Let $g(x) = \log_2(x - 1)$.

Exponential and Logarithmic Inverse Models

Full Worked Solutions - excerpt

Worked example

Problem. Translate the forward multiplier into the inverse relation.

Your complete response must include inverse change.

Use the condition exact base- 4 process.

The forward rule states that input + 1 multiplies output by 4.

Answer. Multiplying an inverse input by 4 increases its recovered output by 1.

Explanation and check.

The former output ratio becomes the inverse input ratio.

Worked example

Problem. Normalize above the baseline before taking a logarithm.

Your complete response must include inverse and domain.

Use the condition all real inputs.

Consider the statement $f(x) = 2 \cdot 6^x + 4$.

Answer. $f^{-1}(x) = \log_6\left(\frac{x-4}{2}\right)$, for $x > 4$.

Explanation and check.

Subtract 4 and divide by 2 to expose the positive power.

AP Precalculus
Logarithmic Function Features

Logarithmic Function Features | APPC-U02-P19

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
03	Match & Move	24 cards
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07	Teacher / Parent Use Guide	included
08	Terms of Use & License	included

Topic focus

Across 96 tasks this topic asks for boundary and domain, domain and asymptote, domain and boundary side, domain and branch location, domain and graph boundary and domain and side.

8 PDFs and a README; 80 buyer pages.

AP Precalculus

Logarithmic Function Features

Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

Use the strict positivity of the affine argument to identify the boundary side. The input condition is real x . Report domain and asymptote. Use rule $y = \log_7(9 - 3x)$.

Bank label: _____

Identify where the real logarithmic branch begins. The input condition is real x . Report boundary and domain. Use rule $y = \log_5(x + 6)$.

Bank label: _____

Locate the excluded boundary and the graph's allowed side. The input condition is real x . Report domain and asymptote. Use rule $y = \log_3(x - 8)$.

Bank label: _____

Determine the vertical scale from the table's ratio-to-difference pattern.

Given model family: $y = a \log_5(x)$

x	y
1	0
5	2
25	4

Bank label: _____

AP Precalculus

Logarithmic Function Features

Name: _____ Date: _____ Class: _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

State which quantities have the constant ratio and why the outputs are equally spaced. Given model: $y = \log_5(x - 2)$ <table border="1" data-bbox="149 546 797 674"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>0</td> </tr> <tr> <td>7</td> <td>1</td> </tr> <tr> <td>27</td> <td>2</td> </tr> </tbody> </table> _____ _____	x	y	3	0	7	1	27	2	Specify three exact anchor points and the boundary needed for a structured sketch. The input condition is $x > 0$. Report anchors, asymptote, and shape. Use axes unit linear scales. Use rule $y = \log_2(x)$. _____ _____
x	y								
3	0								
7	1								
27	2								
Find both attained output extrema on the restricted interval. The input condition is $1 \leq x \leq 8$. Report attained extrema. Use rule $y = \log_2(x)$. _____ _____	State the multiplicative input change paired with each unit output change. Given model: $y = \log_{10}(x)$ <table border="1" data-bbox="824 970 1469 1098"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr> <td>0.1</td> <td>-1</td> </tr> <tr> <td>1</td> <td>0</td> </tr> <tr> <td>10</td> <td>1</td> </tr> </tbody> </table> _____ _____	x	y	0.1	-1	1	0	10	1
x	y								
0.1	-1								
1	0								
10	1								
Use argument values 1, 3, and $\frac{1}{3}$ to specify a structured sketch. The input condition is $x > 1$. Report exact graph features. Use axes unit linear scales. Use rule $y = 2\log_3(x - 1) + 4$. _____ _____	Solve the argument inequality and identify the graph's side of the boundary. The input condition is real x. Report domain, asymptote, and side. Use rule $y = \ln(5 - x)$. _____ _____								

AP Precalculus

Logarithmic Function Features

Name: _____ Date: _____ Class: _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START State both limiting outputs and note whether the vertical shift changes them. The input condition is $x < 3$. Report end behavior. Use rule $y = \log_2(3 - x) + 4$. Your response: _____	Incoming: As x approaches 3 from the left, y approaches -infinity; as x heads to -infinity, y approaches infinity. Use reciprocal e-based inputs to organize a precise sketch. The input condition is $x > 0$. Report exact points and shape. Use axes unit linear scales. Use rule $y = -\ln(x)$. Your response: _____
Incoming: Plot $(\frac{1}{e}, 1)$, $(1, 0)$, and $(e, -1)$; asymptote $x = 0$; the graph decreases and is concave up. Track the outer negative sign at both ends of the domain. The input condition is $x > -3$. Report signed limiting behavior. Use rule $y = -\log \text{ base } \frac{1}{2} \text{ of } (x + 3)$. Your response: _____	Incoming: The output tends to -infinity near -3 from the right and to infinity as x grows without bound. Give the signs of unbounded behavior for a base below one. The input condition is $x > 1$. Report both end limits. Use rule $y = \log \text{ base } \frac{1}{4} \text{ of } (x - 1)$. Your response: _____
Incoming: At $x = 1$ from the right, y tends to infinity; as x tends to infinity, y tends to -infinity. Solve the argument inequality containing a fractional coefficient. The input condition is real x. Report domain and boundary. Use rule $y = \log_7(3 - \frac{x}{2})$. Your response: _____	Incoming: The graph has asymptote $x = 6$ and domain $x < 6$. Describe what happens near $x = 4$ and far to the left. The input condition is $x < 4$. Report allowed-side limits. Use rule $y = \ln(8 - 2x)$. Your response: _____

AP Precalculus

Logarithmic Function Features

Name: _____ Date: _____ Class: _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Correct the claimed effect of the output translation. Identify why adding 6 to the output cannot move the vertical asymptote. Correct the claimed boundary. The input condition is real logarithm. Report repaired feature claim. Use claim Adding 6 to $\log_2(x - 4)$ moves its vertical asymptote from $x = 4$ to $x = 10$..

Repair the inference by separating monotonicity from concavity. Locate the invalid implication from decreasing to concave down, then give both correct properties. The input condition is real logarithm. Report corrected curvature claim. Use claim The graph of log base $\frac{1}{3}$ of x is concave down because it is decreasing..

Repair the statement by distinguishing input position from possible outputs. Identify the confusion between the input side and the output set. Repair both statements. The input condition is real logarithm. Report corrected domain and range. Use claim Since $\ln(4-x)$ is drawn left of $x=4$, its range is $y < 4$..

Explain why an asymptote cannot be used as an anchor point here. Diagnose why the proposed asymptote point is not on the graph and give a valid zero anchor. The input condition is real logarithm. Report correct boundary interpretation. Use claim The vertical asymptote $x = 2$ supplies the point $(2, 0)$ on $y = \log_3(x - 2)$..

Logarithmic Function Features

Full Worked Solutions - excerpt

Worked example

Problem. Separate the sign of an input from the sign of a logarithm output.

Answer. The range is all real numbers; for example $\log_2(\frac{1}{2}) = -1$ even though the argument $\frac{1}{2}$ is positive.

Explanation and check.

Argument positivity is a domain condition, not a restriction to positive outputs.

Worked example

Problem. Solve the strict positivity condition for the entire argument. The input condition is real x . Report domain, asymptote, and branch side. Use rule $y = \ln(-3(x - 4))$.

Answer. Vertical asymptote $x = 4$; domain $x < 4$, so the branch is on the left.

Explanation and check.

The condition $-3(x - 4) > 0$ reverses to $x < 4$.

AP Precalculus

Logarithmic Transformations and Applications

Logarithmic Transformations and Applications | APPC-U02-P20

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Topic focus

Across 96 tasks this topic asks for asymptotes and formulas, formulas and asymptotes, ordered results, resulting rules and relation, two expressions and offset and two formulas and asymptotes.

8 PDFs and a README; 71 buyer pages.

AP Precalculus

Logarithmic Transformations and Applications

Name: _____ Date: _____ Class: _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START

Determine whether the model supplies the requested prediction. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Given: $q > 10$ minutes, calibrated for $12 \leq q \leq 50$

Input: 10; Model: $W(q) = 7 + \ln(q - 10)$; Output units: watts

Your response: _____

Incoming: $k = 6$ and $a = -4$, so $g(x) = -4 \log_2(-x - 3) + 6$; the branch increases.

Predict the held-out mass and report its residual with units. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Given: $x > 0$ days

Documented fit: $y = 12 + 2.5 \ln(x)$; Held out row: (3, 14.5); Output units: grams; Rounding: nearest tenth

Context/domain: $x > 0$ days

1	12.1
2	13.8
5	15.9
9	17.4

Your response: _____

Incoming: A gives $\log_3(3(x - 6))$ with asymptote 6; B gives $\log_3(3x - 6)$ with asymptote 2.

Map the full defining set to the translated graph. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Given: $x > 4$

Axes: unit linear scales; Map: $(x, y) \rightarrow (x + 4, y - 2)$; Parent asymptote: $x = 0$

Context/domain: $x > 4$

1	0
3	1
$\frac{1}{3}$	-1

Your response: _____

Incoming: Prediction about 5.8g; residual about 0.3g, so the model underpredicts.

Write a logarithmic rule satisfying the zero and fivefold-change conditions. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Given: $x > 0$

Input ratio: 5; Normalization: use base 5; Output increment: 2; Zero input: 3

Your response: _____

AP Precalculus

Logarithmic Transformations and Applications

Name: _____ Date: _____ Class: _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Decide whether the requested prediction exists and explain why. Student work: No real prediction exists at $x = 10$ because the logarithm argument is 0; the model requires $x \geq 10$. Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

error hunt

Given: $x > 10$ seconds, calibrated for $12 \leq x \leq 100$

Input: 10; Model: $V(x) = 8 + 3 \cdot \log_2(x - 10)$; Output units: meters per second

Decide whether a fitted residual can be computed for the held-out row. Student work/claim: The displayed fitted equation is an exact identity for every input, including values outside the observed data window. Locate the unsupported exact-fit/extrapolation step, then state the properly qualified model and justify the qualification from the displayed data.

error hunt

Given: $x > 0$ hours

Documented fit: $y = 6 + 1.4 \ln(x)$; Held out row: (0, 5.5); Output units: points

Context/domain: $x > 0$ hours

1	6.1
2	7.0
5	8.3

Logarithmic Transformations and Applications

Full Worked Solutions - excerpt

Worked example

Problem. Build a log curve through $(6, 0)$ whose output drops 4 whenever input triples.

Answer. A suitable rule is $y = -4 \cdot \log_3 \left(\frac{x}{6}\right)$.

Explanation and check.

The normalized argument is 1 at $x = 6$; tripling x raises the logarithm by 1, so scale -4 creates the stated drop.

Worked example

Problem. Construct a model that is zero at $x = 2$ and gains 3 whenever input doubles.

Answer. One normalized model is $y = 3 \cdot \log_2 \left(\frac{x}{2}\right)$.

Explanation and check.

The ratio $\frac{x}{2}$ anchors the zero, and $\log_2$ gains 1 per doubling, so the output scale is 3.

AP Precalculus
Log Properties and Change of Base

Log Properties and Change of Base | APPC-U02-P21

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
03	Match & Move	24 cards
04	Error Analysis & Strategy	24 tasks
05	Quick Answer Key	96 answers
06	Full Worked Solutions	96 solutions
07	Teacher / Parent Use Guide	included
08	Terms of Use & License	included

Topic focus
Across 96 tasks this topic asks for value to nearest thousandth, correction and denominator issue, valid subset and failing branch, correct interval, correct form and domain and source domain and extra condensed intervals.
8 PDFs and a README; 60 buyer pages.

AP Precalculus

Log Properties and Change of Base

Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

Rewrite the logarithm using natural logarithms. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Start with $\log_2(7)$. _____ Bank label: _____	Combine the two terms and carry along the original domain. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Start with $\log_5(u) + \log_5(v)$. _____ Bank label: _____
Separate the positive factors into individual base-five logarithms. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Start with $\log_5(7rs)$. _____ Bank label: _____	Convert the expression to a quotient of common logarithms. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Start with $\log_5(11)$. _____ Bank label: _____
Combine the difference into one base-eight logarithm and retain both source restrictions. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Start with $\log_8(p) - \log_8(q)$. _____ Bank label: _____	Expand the product into separate logarithms of its constant and variable factors. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Start with $\ln(11at)$. _____ Bank label: _____
Represent the value using only natural logarithms. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Start with $\log_6(13)$. _____ Bank label: _____	Correct the proposed power-law rewrite so it is equivalent on the full domain of the original expression. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. The candidate expression is $2\ln(x)$. Start with $\ln(x^2)$. _____ Bank label: _____

AP Precalculus

Log Properties and Change of Base

Name: _____ Date: _____ Class: _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Expand the logarithm completely, keeping the positive constant inside its own logarithm. Start with $\log_2(3xy)$. _____ _____	Condense to one logarithm and retain the domain of the displayed expression. Start with $\log_3(x) + \log_3(y)$. _____ _____
Decide whether the claim is an identity, and justify the decision with one exact counterexample if it is false. Evaluate the claim $\ln(u + v) = \ln(u) + \ln(v)$. _____ _____	Identify the first invalid line and state what valid law could replace the mistaken idea. The student writes: $\ln(a + b) = \ln(a) + \ln(b) = \ln(ab)$. _____ _____
Write the expression as a sum and difference of natural logarithms with no powers inside them. Start with $\ln(a^2 \cdot \frac{\sqrt{b}}{c})$. _____ _____	Produce an equivalent single logarithm and report the original restrictions. Start with $2 \ln(a) - \ln(b)$. _____ _____

AP Precalculus

Log Properties and Change of Base

Name: _____ Date: _____ Class: _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START Expand the quotient and simplify the logarithm of the numerical factor. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Start with $\log_6\left(\frac{x}{36yz}\right)$. Your response: _____	Incoming: Yes; the equality holds for every allowed a and x. Combine the shifted logarithms and derive the allowed x-values from the separate terms. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Start with $\log_7(x + 2) + \log_7(x - 4)$. Your response: _____
Incoming: $k = \frac{1}{2}$ Express the function using a base-three logarithm and simplify the coefficient. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Use logarithms with base 3. Start with $\log_9(y)$. Your response: _____	Incoming: 1.661 Pull the exponent in front without losing inputs less than the center. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Start with $\log_7((z - 1)^2)$. Your response: _____
Incoming: $6 \log_5 2x - 1$, with $x \neq \frac{1}{2}$ Test the proposed quotient rule and disprove it exactly if it is not an identity. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Evaluate the claim $\log_4\left(\frac{u}{v}\right) = \frac{\log_4(u)}{\log_4(v)}$. Your response: _____	Incoming: $\log_3\left(m^4 \cdot \frac{\sqrt[3]{p}}{n^2}\right)$, with $m > 0, n > 0, p > 0$ Find the scaling constant that makes the two logarithmic functions identical. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Use the identity $K \log_3(x) = \log_{81}(x)$. Your response: _____

AP Precalculus

Log Properties and Change of Base

Name: _____ Date: _____ Class: _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Evaluate the identity claim and, if needed, refute it using powers of 2. Identify the precise error or unsupported step in the stated claim or method, then give the corrected conclusion and justify it from the supplied information.

Evaluate the claim $\log_2(uv) = \log_2(u) \log_2(v)$.

Use base 2 as the change-of-base reference to find the exact value. Student work: $-\frac{3}{1}$ Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

The reference logarithm base is 2.

Start with $\log_4(8)$.

Log Properties and Change of Base

Full Worked Solutions - excerpt

Worked example

Problem. Expand the logarithm completely, keeping the positive constant inside its own logarithm.

Start with $\log_2(3xy)$.

Answer. $\log_2(3) + \log_2(x) + \log_2(y)$

Explanation and check.

The argument is a product of the three positive factors 3 , x , and y , so the product law separates them.

Worked example

Problem. Decide whether the claim is an identity, and justify the decision with one exact counterexample if it is false.

Evaluate the claim $\ln(u + v) = \ln(u) + \ln(v)$.

Answer. False; $u = v = 1$ gives $\ln(2)$ on the left and 0 on the right.

Explanation and check.

Logarithms convert products, not sums, into sums; the positive pair $1, 1$ directly contradicts the claim.

AP Precalculus
Solving Exponential Equations

Solving Exponential Equations | APPC-U02-P22

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
03	Match & Move	24 cards
04	Error Analysis & Strategy	24 tasks
05	Quick Answer Key	96 answers
06	Full Worked Solutions	96 solutions
07	Teacher / Parent Use Guide	included
08	Terms of Use & License	included

Topic focus

Across 96 tasks this topic asks for real solution set, time-domain conclusion, time or impossibility, solution set, all real solutions and finite none or all.

8 PDFs and a README; 64 buyer pages.

AP Precalculus

Solving Exponential Equations

Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Rewrite the reciprocal as a power of 3 and equate exponents. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Context/domain: real x. equation: $3^{x-2} = \frac{1}{27}$. _____ Bank label: _____	Solve the exponential equation exactly using logarithms. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Context/domain: real x. equation: $3^x = 10$. _____ Bank label: _____
Use the indicated positive substitution and recover every admissible x-value. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Context/domain: real x. equation: $4^x - 5 \cdot 2^x + 4 = 0$; substitution: $u = 2^x$. _____ Bank label: _____	Find the unique real input where the two exponential expressions are equal. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Context/domain: real x. equation: $2 \cdot 3^x = 6 \cdot 2^x$. _____ Bank label: _____
Rewrite the reciprocal and the left side as powers of 2. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Context/domain: real x. equation: $4^{x-1} = \frac{1}{8}$. _____ Bank label: _____	Give the exact solution using natural logarithms. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Context/domain: real x. equation: $7^x = 13$. _____ Bank label: _____
Factor after substitution and invert both positive values of u. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Context/domain: real x. equation: $9^x - 5 \cdot 3^x + 4 = 0$; substitution: $u = 3^x$. _____ Bank label: _____	Divide to obtain one base-two power and solve the crossover exactly. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Context/domain: real x. equation: $2 \cdot 4^x = 16 \cdot 2^x$. _____ Bank label: _____

AP Precalculus

Solving Exponential Equations

Name: _____ Date: _____ Class: _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Choose a so that $x = 2$ is a solution, then decide whether that equation has any other real solution. Context/domain: $a > 0$ and real x. equation: $a \cdot 3^x = 45$; required solution: $x = 2$. _____ _____	Identify the first invalid logarithm step and solve the original equation correctly. Context/domain: real x. equation: $2^x + 3 = 11$; student work: $[\ln(2^x) + \ln(3) = \ln(11), x = \frac{\ln(11)}{\ln(2)+\ln(3)}]$. _____ _____
Solve without dividing by an expression that could be zero, and classify the solution set. Context/domain: real x. equation: $5 \cdot 2^x = 7 \cdot 2^x$. _____ _____	Choose k from the prescribed solution, then inspect whether $x = 3$ remains the only solution. Context/domain: $k > 0$ and real x. equation: $k \cdot 2^x = 4 \cdot 2^{x+1}$; required solution: $x = 3$. _____ _____
Find the first point at which the student turns an inadmissible substitution root into an x-value. Context/domain: real x. equation: $4^x + 3 \cdot 2^x - 4 = 0$; student work: $[u = 2^x, (u - 1)(u + 4) = 0, x = 0 \text{ or } x = 2]$. _____ _____	Solve the level equation conceptually and determine whether its time belongs to the model's operating domain. Context/domain: $t \geq 0$ years. model: $A(t) = 200(1.1)^t$; target: 150 units. _____ _____

AP Precalculus

Solving Exponential Equations

Name: _____ Date: _____ Class: _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START Solve exactly without approximating the irrational exponent. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context/domain: real x . equation: $11^x = 2$. Your response: _____	Incoming: $x \approx 1.771$, uniquely on $[-2, 3]$ Use the positive substitution and invert both factored roots. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context/domain: real x . equation: $16^x - 5 \cdot 4^x + 4 = 0$; substitution: $u = 4^x$. Your response: _____
Incoming: $n = 4$ Express every factor as a power of 3 and solve. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context/domain: real x . equation: $3 \cdot 9^x = 81 \cdot 3^x$. Your response: _____	Incoming: $x = 4$ Use the unique exponent that produces 1 for base 5, then solve the resulting algebraic equation. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context/domain: real x . equation: $5^{x^2-3x} = 1$. Your response: _____
Incoming: $x = \frac{2}{3}$ Isolate the positive exponential quantity and state the exact real solution. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context/domain: real x . equation: $7 \cdot 3^{2x} - 1 = 0$. Your response: _____	Incoming: $x = 1$ or $x = \frac{\ln(3)}{\ln(2)}$ Form one exponential ratio and solve for the crossover input. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context/domain: real x . equation: $3 \cdot 5^x = 12 \cdot 2^x$. Your response: _____

AP Precalculus

Solving Exponential Equations

Name: _____ Date: _____ Class: _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Determine whether the declining model reaches the higher target after $t = 0$. Student work: No nonnegative time; 360 would require extending the growth model backward. Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens. error hunt. Context/domain: $t \geq 0$ weeks. model: $A(t) = 300(0.9)^t$; target: 360 units.

Apply the repeated-exponential substitution and verify both recovered exponents. Student work: $x = 1$ or $x = 4$ Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens. error hunt. Context/domain: real x . equation: $9^x - 30 \cdot 3^x + 81 = 0$; substitution: $u = 3^x$.

Choose a to make $x = 3$ a solution and check whether the solution is unique. Student work: $a = 3$; strict increase makes $x = 3$ not unique Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens. error hunt. Context/domain: $a > 0$. equation: $a \cdot 4^{x-1} = 48$; required solution: $x = 3$.

Evaluate the x -independent exponential and decide whether the equation is an identity or contradiction. Student work: No x works because the left side is fixed at 171, not 169. Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens. error hunt. Context/domain: real x . equation: $7 \cdot 5^{0x+2} - 4 = 170$.

Solving Exponential Equations

Full Worked Solutions - excerpt

Worked example

Problem. Use base 3, solve the resulting quadratic, and retain both real roots. Context/domain: real x . equation: $9^{x^2} = 3^{5x+6}$.

Answer. $x = \frac{5-\sqrt{73}}{4}$ or $x = \frac{5+\sqrt{73}}{4}$

Explanation and check.

Equating exponents gives $2x^2 - 5x - 6 = 0$, whose discriminant is 73.

Worked example

Problem. Express every factor as a power of 3 and solve. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context/domain: real x . equation: $3 \cdot 9^x = 81 \cdot 3^x$.

Answer. $x = 3$ from $2x + 1 = x + 4$

Explanation and check.

The sides become 3^{2x+1} and 3^{x+4} , whose exponents agree only at $x = 3$.

AP Precalculus

Solving Logarithmic Equations

Solving Logarithmic Equations | APPC-U02-P23

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
03	Match & Move	24 cards
04	Error Analysis & Strategy	24 tasks
05	Quick Answer Key	96 answers
06	Full Worked Solutions	96 solutions
07	Teacher / Parent Use Guide	included
08	Terms of Use & License	included

Topic focus

Across 96 tasks this topic asks for complete solution set, solution interval, solution intervals, solution set, correct root and method error and correct solution set and domain error.

8 PDFs and a README; 94 buyer pages.

AP Precalculus

Solving Logarithmic Equations

Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Find the intensity ratio represented by the logarithmic scale target. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Your complete response must include positive intensity ratio. Use the condition $\frac{I}{I_0} > 0$. Use the model $L = 10 \log\left(\frac{I}{I_0}\right)$. The target is $L = 30$ decibels. _____ Bank label: _____	Solve the quadratic in the logarithmic quantity and exponentiate each real u-root. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Your complete response must include positive x-solutions. Use the condition $x > 0$. Solve the equation $(\log_2(x))^2 - 3 \log_2(x) + 2 = 0$. Use the substitution $u = \log_2(x)$. _____ Bank label: _____
Solve by exponentiating and verify the logarithm's original argument condition. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Your complete response must include real solution set. Use the condition real x. Solve the equation $\log_2(x - 1) = 3$. _____ Bank label: _____	Recover the concentration represented by the given pH target. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Your complete response must include positive hydrogen-ion concentration. Use the condition $[H^+] > 0 \text{ mol/L}$. Use the model $\text{pH} = -\log([H^+])$. The target is $\text{pH} = 6.5$. _____ Bank label: _____

AP Precalculus

Solving Logarithmic Equations

Name: _____ Date: _____ Class: _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Check both algebraic candidates in the two original logarithm arguments. Your complete response must include valid solution set and rejection reason. Use the condition real x. Solve the equation $\log_2(x - 3) + \log_2(x - 5) = 3$. The student proposes the candidate values 17. _____ _____	Condense the logs, solve the quadratic, and enforce both starting restrictions. Your complete response must include valid roots. Use the condition real x. Solve the equation $\log_2(x - 1) + \log_2(x + 1) = 3$. _____ _____
Exponentiate, solve the quadratic, and test both roots in the original argument. Your complete response must include all real roots. Use the condition real x. Solve the equation $\log_3(x^2 - 5) = 2$. _____ _____	Use the supplied maximum fact to determine whether the curves ever meet. Your complete response must include solution set. Use the condition $x > 0$. Solve the equation $\ln(x) = x$. Use the supplied evidence: For $x > 0$, $\ln(x) - x$ has maximum -1 at $x = 1$. _____ _____
Recover the intensity ratio, then decide whether the calibrated model supports that target. Your complete response must include ratio and calibration status. Use the condition $1 \leq \frac{I}{I_0} \leq 10^8$ calibration range. Use the model $L = 10 \log(\frac{I}{I_0})$. The target is 100 decibels. _____ _____	Explain why exponentiating to obtain 9 does not validate the student's answer in the real logarithm setting. Your complete response must include correct conclusion. Use the condition real x. Solve the equation $\log_{-3}(x) = 2$. The student reports $x = 9$. _____ _____

AP Precalculus

Solving Logarithmic Equations

Name: _____ Date: _____ Class: _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: $x = 2 + \sqrt{3}$ only Factor the quadratic in u and invert the natural logarithm for both roots. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Your complete response must include positive x-solutions. Use the condition $x > 0$. Solve the equation $(\ln(x))^2 - 5 \ln(x) + 6 = 0$. Use the substitution $u = \ln(x)$. Your response: _____	Incoming: $x = 10$ Exponentiate the equation and verify positivity of the original argument. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Your complete response must include real root. Use the condition real x. Solve the equation $\log_7(2x - 5) = 2$. Your response: _____
Incoming: $x = e^2$ or $x = e^3$ Use both roots of the difference of squares and exponentiate each one. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Your complete response must include positive x-solutions. Use the condition $x > 0$. Solve the equation $(\log_4(x))^2 - 1 = 0$. Use the substitution $u = \log_4(x)$. Your response: _____	Incoming: $x = e$ is the only intersection Determine the input count that reaches the stated logarithmic capacity target. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Your complete response must include positive device count. Use the condition $n > 0$ devices. Use the model $C(n) = 12 \log_2(n)$. The target is $C = 48$ units. Your response: _____
Incoming: $x \approx 2.763$, the sole intersection for $x > 1$ Intersect the argument restrictions and then equate the arguments. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Your complete response must include valid root. Use the condition real x. Solve the equation $\ln(2 - x) = \ln(x + 5)$. Your response: _____	Incoming: $x = 2 + \sqrt{10}$ only Condense the difference and retain the common positivity restriction. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Your complete response must include valid real root. Use the condition real x. Solve the equation $\ln(x + 2) - \ln(x - 4) = \ln(3)$. Your response: _____

AP Precalculus

Solving Logarithmic Equations

Name: _____ Date: _____ Class: _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Use injectivity and check the result against both affine positivity conditions. Student work: $x = \frac{9}{3}$ Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

Your complete response must include valid rational root.

Use the condition real x .

Solve the equation $\log_7(3x + 2) = \log_7(11 - x)$.

Factor in u and remember that both negative logarithmic values produce positive inputs. Student work: $x = e^{+1}$ or $x = e^{-5}$ Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

Your complete response must include positive x -values.

Use the condition $x > 0$.

Solve the equation $(\ln(x))^2 + 6 \ln(x) + 5 = 0$.

Use the substitution $u = \ln(x)$.

Solving Logarithmic Equations

Full Worked Solutions - excerpt

Worked example

Problem. Solve the condensed quadratic and screen its roots against each source logarithm.

Your complete response must include valid solution set.

Use the condition real x .

Solve the equation $\log_5(x) + \log_5(x + 4) = 1$.

Answer. $x = 1$; discard $x = -5$

Explanation and check.

The source requires $x > 0$. Since $x(x + 4) = 5$ has roots 1 and -5 , only 1 remains.

Worked example

Problem. Equate the same-base arguments, then check positivity at each resulting root.

Your complete response must include all valid roots.

Use the condition real x .

Solve the equation $\log_3(x^2 + 2) = \log_3(5x - 4)$.

Answer. $x = 2$ or $x = 3$; both arguments are positive

Explanation and check.

The equation $x^2 + 2 = 5x - 4$ factors as $(x - 2)(x - 3) = 0$, and both roots make $5x - 4$ positive.

AP Precalculus
Exponential and Logarithmic Inequalities

Exponential and Logarithmic Inequalities | APPC-U02-P24

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
03	Match & Move	24 cards
04	Error Analysis & Strategy	24 tasks
05	Quick Answer Key	96 answers
06	Full Worked Solutions	96 solutions
07	Teacher / Parent Use Guide	included
08	Terms of Use & License	included

Topic focus

Across 96 tasks this topic asks for case intervals, solution by k region, solution intervals by base region, solutions by m sign, solutions by p sign and case solutions.

8 PDFs and a README; 69 buyer pages.

AP Precalculus

Exponential and Logarithmic Inequalities

Name: _____ Date: _____ Class: _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Use the intersection as a boundary and identify where the exponential is at or below the horizontal line. Context: real x or the stated contextual schedule. the horizontal axis measures input; the vertical axis measures output; the displayed window has $-2 \leq x \leq 4$ and $0 \leq y \leq 25$. The comparison is $e^x \leq e^2$. Compare the curves ($y = e^x, y = e^2$). The intersection is at $x = 2$; this input is included. _____ _____	Separate increasing and decreasing valid bases before comparing exponents. Context: real x or the stated contextual schedule. Solve the inequality $a^x > a^2$. Assume $a > 0$ and $a \neq 1$. _____ _____
Check the order direction for the reciprocal base. Context: real x or the stated contextual schedule. Solve the inequality $(\frac{1}{2})^x > (\frac{1}{2})^3$. Evaluate this student answer: $x > 3$. _____ _____	Separate positive, negative, and zero scale factors before dividing. Context: real x or the stated contextual schedule. Solve the inequality $k \cdot 2^x \leq 8k$. Assume real k. _____ _____
First reduce the two positivity conditions, then compare the arguments and intersect the sign solution. Context: real x or the stated contextual schedule. Solve the inequality $\ln(x^2 - 4) > \ln(3x)$. _____ _____	Partition the parameter by monotonicity and retain the positive argument domain in both cases. Context: real x or the stated contextual schedule. Solve the inequality $\log_a(x) > 1$. Assume $a > 0$ and $a \neq 1$. _____ _____

AP Precalculus

Exponential and Logarithmic Inequalities

Name: _____ Date: _____ Class: _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START Combine positivity with the nonpositive logarithm condition. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context: real x. Solve the inequality $\ln(x + 5) \leq 0$. Your response: _____	Incoming: Week 4 Compare exponents of the increasing natural base. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context: real x. Solve the inequality $e^{2x-1} > e^3$. Your response: _____
Incoming: $[2, 8]$ within the displayed domain Remove the factor 2 before using the base-five boundary. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context: real x. Solve the inequality $2 \cdot 5^x + 3 > 13$. Your response: _____	Incoming: $\log_{\frac{1}{2}}(3) < x < -1$ Separate coefficient signs before division. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Context: real x and real s. Solve the inequality $s \cdot 2^x < 4s$. Your response: _____

AP Precalculus

Exponential and Logarithmic Inequalities

Name: _____ Date: _____ Class: _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Use the crossing and graph order on either side. Student work: $(-1, \infty)$ Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

Context: real x .

Use standard Cartesian axes; the horizontal axis measures input; the vertical axis measures function value.

The comparison is $e^x > 1$.

Compare the curves $(y = e^x, y = 1)$.

The intersection is at $x = 0$; this input is excluded.

The displayed window has $-3 \leq x \leq 3$ and $0 \leq y \leq 8$.

Use strict positivity of the exponential to classify the threshold. Student work: $x = 0$ is a solution because both sides of $2 - 5^x \geq 2$ are then nonnegative. Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

Exponential and Logarithmic Inequalities

Full Worked Solutions - excerpt

Worked example

Problem. Use strict positivity of the exponential to classify the threshold. Student work: $x = 0$ is a solution because both sides of $2 - 5^x \geq 2$ are then nonnegative. Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

Answer. No real solution

Explanation and check.

The inequality would require $-5^x \geq 0$, impossible because $5^x > 0$.

Worked example

Problem. Reverse when removing the negative factor, then intersect with strict argument positivity.

Context: real x .

Solve the inequality $-\log_2(x^2 - 4) \geq -1$.

Answer. $[-\sqrt{6}, -2) \cup (2, \sqrt{6}]$

Explanation and check.

The conditions are $x^2 > 4$ and $x^2 - 4 \leq 2$, so $4 < x^2 \leq 6$.

AP Precalculus
Linearizing Exponential Data

Linearizing Exponential Data | APPC-U02-P25

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
03	Match & Move	24 cards
04	Error Analysis & Strategy	24 tasks
05	Quick Answer Key	96 answers
06	Full Worked Solutions	96 solutions
07	Teacher / Parent Use Guide	included
08	Terms of Use & License	included

Topic focus

Across 96 tasks this topic asks for corrected line, least integer threshold, ratio and observed value, slope evolution, tail behavior and values and explanation.

8 PDFs and a README; 73 buyer pages.

AP Precalculus

Linearizing Exponential Data

Name: _____ Date: _____ Class: _____

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

Linearize the decay model in base 3. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Use $y = 9(\frac{1}{3})^x$. Use the transformation $Y = \log_3(y)$.

Bank label: _____

Read the original output at the marked height $x = 2$. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Use these axis scales: scale logarithmic y ; linear x ; x input; y original y on base-10 logarithmic scale. The marked point has $x2$; y label 100. The labeled levels are 1, 10, 100, 1000.

Bank label: _____

Use the fitted table to predict the original output at $x = 4$. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value.

Context/domain: data

x	fitted $Y = \ln(y)$
0	0
2	1
4	2

Bank label: _____

Place the decay observations on a base-2 transformed table. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value. Use logarithm base 2. The raw observations are (0, 8), (1, 4), and (2, 2); only these observations are asserted. Construct the transformed output column yourself.

Context/domain: data

x	raw y
0	8
1	4
2	2

Bank label: _____

AP Precalculus

Linearizing Exponential Data

Name: _____ Date: _____ Class: _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Diagnose the parameter error and state the correct factor. The given line is $Y = 1 + 0.3x$. A student claims: The raw growth factor is 0.3. Use the transformation $Y = \log_{10}(y)$. 	Write the transformed line and identify its intercept and slope. Use $y = 4(2^x)$. Use the transformation $Y = \log_2(y)$. 						
Correct the student's reading of the plotted point. Use these axis scales: scale linear-linear transformed plot; x input; $yY = \log_2(y)$. The point are 3, 5. A student reads $y = 5$. 	Express the semi-log line exactly and interpret the two coefficients. Use $y = 5(100^x)$. Use the transformation $Y = \log_{10}(y)$. 						
Compare the initial values and one-input growth factors. Use these axis scales: scale linear-linear transformed plot; x input unit; $yY = \log_{10}(y)$. The lines are (model P; rule $Y = 1 + 0.4x$), (model Q; rule $Y = 2 + 0.4x$). 	Map all three raw observations to the base-4 plot. Context/domain: data <table border="1" data-bbox="824 1360 1469 1455"> <tbody> <tr> <td>0</td> <td>2</td> </tr> <tr> <td>1</td> <td>8</td> </tr> <tr> <td>3</td> <td>128</td> </tr> </tbody> </table> 	0	2	1	8	3	128
0	2						
1	8						
3	128						

AP Precalculus

Linearizing Exponential Data

Name: _____ Date: _____ Class: _____

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START Recover the positive raw y-value represented by $Y = -2$. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Use these axis scales: scale linear in Y; x input; $yY = \log_{10}(y)$. The point are $-1, -2$. Your response: _____	Incoming: Y-values $\log_2(16)=4, \log_2(20), \log_2(28)$; their increments are unequal. Predict y at $x = 2$. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. The fitted relation is $Y = 1 + 0.5x$ where $Y = \log_{10}(y)$. Evaluate at input 2. The observations cover x in 0, 4. Your response: _____
Incoming: $x = 1$ and common $y = 27$ State the original output at the plotted point (3, 5). Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Use these axis scales: scale linear in Y; x stage; $yY = \log_2(y)$. The point are 3, 5. Your response: _____	Incoming: $Y = 4.5$ and $y = 16\sqrt{2}$ Convert the fitted height at $x = 1$ to original units. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. The fitted relation is $Y = 3-x$ where $Y = \log_2(y)$. Evaluate at input 1. The observations cover x in 0, 3. Your response: _____
Incoming: The slope is initially negative but approaches 0 as Y approaches $\log_3(9)=2$. What multiplicative change is encoded by moving one labeled vertical interval from 1 to 10? Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Your response: _____	Incoming: $y = 100(\frac{1}{\sqrt{5}})^x$ Translate the half-unit rise into a ratio of original outputs. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task. Use these axis scales: scale linear in Y; x input; $yY = \log_4(y)$. The vertical displacement is 0.5. Your response: _____

AP Precalculus

Linearizing Exponential Data

Name: _____ Date: _____ Class: _____

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Judge the student's claim that equal-looking log increments prove $y = 10(1.5^x)$ exactly. Student work/claim: The displayed fitted equation is an exact identity for every input, including values outside the observed data window. Locate the unsupported exact-fit/extrapolation step, then state the properly qualified model and justify the qualification from the displayed data.

Context/domain: data

x	raw y	Y=log_base(y)
0	10.0	1.0
1	15.1	1.179
2	22.4	1.35
3	34.0	1.531

Construct every admissible transformed row and diagnose the remaining observation. Student work: (0, 1.079) and (3, 2.079) are admissible; $x = 1$ can be plotted because $y = 0$ Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

Context/domain: data

x	raw y	Y=log_base(y)
0	12	1.079
1	0	_____
3	120	2.079

Linearizing Exponential Data

Full Worked Solutions - excerpt

Worked example

Problem. Write the transformed line and identify its intercept and slope. Use $y = 4(2^x)$. Use the transformation $Y = \log_2(y)$.

Answer. $Y = 2 + x$; intercept 2 and slope 1

Explanation and check.

$\log_2(4) = 2$ and $\log_2(2) = 1$, so logarithms turn the product into $2 + x$.

Worked example

Problem. What multiplicative change is encoded by moving one labeled vertical interval from 1 to 10? Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Answer. a factor of 10

Explanation and check.

Consecutive decade levels differ by a ratio of 10 even though their numerical differences are not constant.