Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Logarithmic Function Features

Logarithmic Function Features | APPC-U02-P19

96 problems · Four activity formats

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.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

Published by Tusils LLC.

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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: _____

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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: $y = \log_5(x - 2)$

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 $y = \log_2(x)$.

Find both attained output extrema on the restricted interval. The input condition is $1 \le x \le 8$. Report attained extrema. Use rule $y = \log_2(x)$.

State the multiplicative input change paired with each unit output change.

Given model: $y = \log_{10}(x)$

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).

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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 $y = -\log$ base $\frac{1}{2}$ 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 $y = \log$ base $\frac{1}{4}$ 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: _____

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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 $y=\log_3(x-2)$..

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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 $x < 4$.