Sets & Steps
Math Practice & Worked Solutions

Precalculus

Trig Identities, Equations & Inequalities | 5-Topic Precalculus Bundle

5-topic bundle | 480 problems | Four activity formats

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01 **Reciprocal, Quotient, and Pythagorean Trig Identities**

View individual product and its full preview

02 **Angle Sum, Difference, and Double-Angle Identities**

View individual product and its full preview

03 **Inverse Trigonometric Functions**

View individual product and its full preview

04 **Solving Trigonometric Equations**

View individual product and its full preview

05 **Trigonometric Inequalities**

View individual product and its full 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.

40 PDFs and 5 READMEs; 362 buyer PDF pages across the 5 products.

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

This is a fixed collection of the listed products. Purchase includes the existing individual resource files. To open a product's online preview, follow its title link and select View Preview.

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Sets & Steps
Math Practice & Worked Solutions

Precalculus

Reciprocal, Quotient, and Pythagorean Trig Identities

Trigonometric Functions | APPC-U03-P21

96 problems · Four activity formats

Topic focus

Use reciprocal and quotient identities, derive Pythagorean forms, simplify expressions, and justify domain restrictions and sign choices.

8 PDFs and a README; 62 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, method-choice labels, and matching responses are retained. Full answer keys are not included.

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Precalculus

Reciprocal, Quotient, and Pythagorean Trig Identities

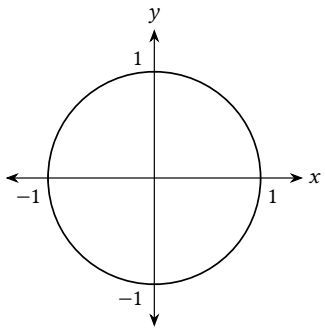
Name: _____ **Date:** _____ **Class:** _____

Answer each question and record the matching bank letter. Give exact values and the requested justification. Angles are in radians; k is an integer.

Rewrite $\sec x$ using cosine and state the inputs allowed by the original expression.

Bank label: _____

A terminal ray lies in quadrant II and $\sin^2\theta = \frac{9}{25}$. Recover $\sin\theta$.



Bank label: _____

Use the Pythagorean identity to rewrite $1 - \sin^2\theta$ as one squared trigonometric function.

Bank label: _____

Simplify $\frac{1}{\csc x}$, but retain the domain of the written original expression.

Bank label: _____

Precalculus

Reciprocal, Quotient, and Pythagorean Trig Identities

Name: _____ **Date:** _____ **Class:** _____

Answer each question and show your reasoning. Use radians, exact values, and all stated domain restrictions. In excluded-input families, k is an integer.

Express $\tan x$ using sine and cosine, including its domain condition.	The expression $\frac{\sin x}{\tan x}$ simplifies to $\cos x$. On which inputs is the simplification equal to the original, and which inputs does the simplified formula newly admit?
Divide $\sin^2 x + \cos^2 x = 1$ by $\cos^2 x$ and name every quotient. State the required condition.	Refute the proposed identity $\sec x = \cos x$ using an input where both sides are defined.
Rewrite $\frac{\tan x}{\cot x}$ entirely in sine and cosine and simplify. Preserve the original restrictions.	After replacing $1 - \cos^2 x$, the expression $\frac{1-\cos^2 x}{\sin x}$ becomes $\sin x$. Compare the domains of the two formulas.

Precalculus

Reciprocal, Quotient, and Pythagorean Trig Identities

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: $\cot x$ for $\sin x \neq 0$ Rewrite $\sin^2 x + 2\cos^2 x$ as 1 plus one squared trig term. Your response: _____	**Incoming:** $\sin\theta = \frac{7}{8}$ Use the reciprocal definition to express $\sec x \sin x$ as a quotient function, retaining its domain. Your response: _____
Incoming: $\cos\theta = -2\frac{\sqrt{6}}{5}$ Rewrite $\tan x \cos^2 x$ using only sine and cosine and simplify. Your response: _____	**Incoming:** $\cot^2 t = \csc^2 t - 1$ for $\sin t \neq 0$ Rewrite $2(\cos^2 t - 1)$ in terms of $\sin^2 t$. Your response: _____

Precalculus

Reciprocal, Quotient, and Pythagorean Trig Identities

Name: _____ **Date:** _____ **Class:** _____

Evaluate the supplied statements or methods. Explain your decision and complete the requested task. Not every prompt contains an error.

A derivation divides $\sin^2 x + \cos^2 x = 1$ by $\sin^2 x$ "for every real x." Repair the step and state the resulting identity.

Test the claim $1 - \cos^2 x = \sin x$. Give a counterexample and replace it with the correct identity.

Repair the step $\sqrt{\cos^2 x} = \cos x$. Give a correct all-real formula and explain when the student's version happens to agree.

Refute $\sqrt{\sin^2 x} = \sin x$ as an all-real identity, then write the correct version.

Reciprocal, Quotient, and Pythagorean Trig Identities

Full Worked Solutions - excerpt

Worked example

Problem. Rewrite $\sec x$ using cosine and state the inputs allowed by the original expression.

Answer. $\sec x = \frac{1}{\cos x}$ for $\cos x \neq 0$

Explanation and check.

$\sec x = \frac{1}{\cos x}$

Cosine is defined for every real x, but the denominator must be nonzero. Therefore $\cos x \neq 0$, or equivalently $x \neq \frac{\pi}{2} + k\pi$.

Worked example

Problem. A terminal ray lies in quadrant II and $\sin^2\theta = \frac{9}{25}$. Recover $\sin\theta$.

Answer. $\sin\theta = \frac{3}{5}$

Explanation and check.

$\sin^2\theta = \frac{9}{25}$

$\sin\theta = \pm(\frac{3}{5})$

Sin is positive on quadrant II. Select the matching sign.

$\sin\theta = \frac{3}{5}$

Check the given square: $\frac{9}{25}$; the selected sign also meets the location condition.

Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Angle Sum, Difference, and Double-Angle Identities

Angle Sum, Difference, and Double-Angle Identities | APPC-U03-P22

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for cos(α-β), cos 2x, equivalent expression, rewrite and range, exact value and rewrite and maximum.

8 PDFs and a README; 75 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.

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AP Precalculus

Angle Sum, Difference, and Double-Angle Identities

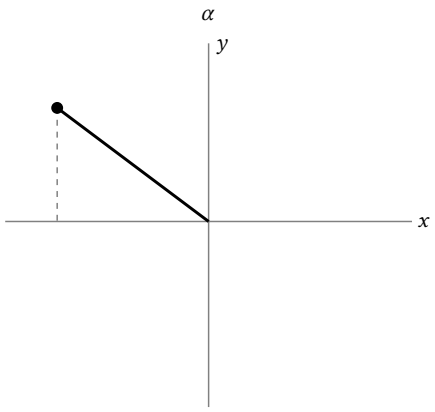
Name: _____ **Date:** _____ **Class:** _____

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

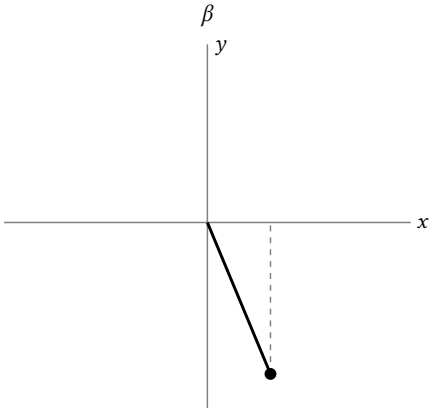
Use a difference identity to obtain the exact value of $\cos 15^\circ$.

Bank label: _____

Angle α lies in quadrant II with $\tan\alpha = -\frac{3}{4}$, and β lies in quadrant IV with $\sec\beta = \frac{13}{5}$. Find $\sin(\alpha - \beta)$.



$(-4, 3)$



$(5, -12)$

Bank label: _____

AP Precalculus

Angle Sum, Difference, and Double-Angle Identities

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.

Prove $\frac{1-\cos 2x}{\sin 2x} = \tan x$ by transforming the left side, and state the common domain.	Use $120^\circ + 45^\circ$ to evaluate $\cos 165^\circ$. Write the result so its negative sign is visually clear.
Verify $\frac{1+\cos 2x}{\sin 2x} = \cot x$ from the left side and identify every excluded family in the original equality.	Find $\sin 105^\circ$ exactly and use its quadrant to check the sign of your result.
Starting from $\cos 2x = \frac{5}{13}$, select two forms of the cosine double-angle identity to determine $\cos^2 x$ and $\sin^2 x$.	A rewrite begins with $\sin(\alpha + \beta) = \sin\alpha + \sin\beta$. Identify the invalid assumption and replace it with a correct first line.

AP Precalculus

Angle Sum, Difference, and Double-Angle Identities

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

Evaluate $\sin 75^\circ$ exactly by decomposing the angle into familiar angles.

Your response: _____

AP Precalculus

Angle Sum, Difference, and Double-Angle Identities

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.

A short route cancels $\cos x$ and announces an identity for all real x. A second route checks domains first. Decide which conclusion is valid and repair the quantifier.

Evaluate the claim $\frac{\sin 2x}{2\cos x} = \sin x$ for all real x.

Work on the domain real x.

The route A is cancel $\cos x$.

The route B is compare original domains first.

The output is corrected claim.

A student writes $\cos 2x = 2\cos x - 1$. Repair the rule and give one input that reveals the missing square.

Angle Sum, Difference, and Double-Angle Identities

Full Worked Solutions - excerpt

Worked example

Problem. Transform $\sin 2x - 2\cos x$ into a product that displays its two zero-producing factors. Do not find the roots.

Answer. $2\cos x(\sin x - 1)$

Explanation and check.

Substitute $2\sin x\cos x$ for $\sin 2x$ and factor the common $2\cos x$.

Worked example

Problem. Rewrite $2\cos^2 x = 1 + \sin x$ as a polynomial equation in $\sin x$, without solving for x.

Answer. $2\sin^2 x + \sin x - 1 = 0$

Explanation and check.

Substitute $\cos^2 x = 1 - \sin^2 x$ and collect: $2 - 2\sin^2 x = 1 + \sin x$, so $2\sin^2 x + \sin x - 1 = 0$.

Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Inverse Trigonometric Functions

Inverse Trigonometric Functions | APPC-U03-P16

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for valid inverse pair and reason for discarding a row, reason proposal fails and a valid restriction, validity and approximate corrected sign, defined or undefined, real-defined or undefined with failed restriction and validity and location of output.

8 PDFs and a README; 67 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.

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AP Precalculus

Inverse Trigonometric Functions

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.

Evaluate $\arcsin(-\frac{\sqrt{3}}{2})$ exactly. Identify the compatible unit-circle angle that lies in the principal range $[-\frac{\pi}{2}, \frac{\pi}{2}]$. Bank label: _____	Let $\theta = \arcsin(\frac{5}{13})$. A right triangle for θ has opposite side 5 and hypotenuse 13. Find $\cos\theta$ and explain why its sign is forced by the arcsine branch. Bank label: _____
Evaluate $\arcsin(\sin(5\frac{\pi}{6}))$. Do not cancel the two function names; use a symmetry relation to place the result in the arcsine range. Bank label: _____	Find the exact principal value of $\arccos(-\frac{\sqrt{2}}{2})$. Use the sign of cosine and the required range $[0, \pi]$ to select the angle. Bank label: _____
Set $\theta = \arccos(-\frac{8}{17})$ and represent θ by a point (x, y) on a circle of radius 17 with $x = -8$. Determine $\tan\theta$, including its sign, from the principal arccos range. Bank label: _____	In radian mode, estimate $\arcsin(0.98)$ to the nearest thousandth. Verify that the rounded result lies in the correct principal interval. Bank label: _____
Reduce $\arccos(\cos(7\frac{\pi}{6}))$ to its principal value. Explain the reflection that produces an angle in $[0, \pi]$. Bank label: _____	Evaluate $\sin(\arctan(-\frac{7}{24}))$ exactly. Build a signed coordinate triangle compatible with the inverse-tangent range rather than treating the inner ratio as a sine value. Bank label: _____

AP Precalculus

Inverse Trigonometric Functions

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.

Is $\arccos(\frac{6}{5})$ defined as a real number? Name the restriction that decides the question.

AP Precalculus

Inverse Trigonometric Functions

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: $-\frac{\pi}{6}$

Place $13\frac{\pi}{6}$ on the tangent graph and remove enough periods to reach the inverse-tangent branch. Evaluate the composition.

Your response: _____

Incoming: y = arccos *x*.

Both $-\frac{\pi}{6}$ and $5\frac{\pi}{6}$ have tangent $-\frac{\sqrt{3}}{3}$. Which one equals $\arctan(-\frac{\sqrt{3}}{3})$, and why is the other rejected?

Your response: _____

Incoming: $\sqrt{(1-v^2)}$, for $-1 \le v \le 1$

Estimate $\arccos(-0.6)$ to the nearest tenth of a degree. Use the negative input to check the calculator's quadrant.

Your response: _____

Incoming: 126.9 degrees

For $\theta = \arccos(-\frac{3}{5})$, place a point of radius 5 with $x = -3$ in the correct half of the unit-circle model. Find $\sin\theta$.

Your response: _____

Incoming: 0.045 radians

Without finding θ itself, evaluate $\cot(\arctan(-\frac{9}{40}))$. State why this reciprocal is defined.

Your response: _____

Incoming: $\frac{\pi}{3}$

A calculation table records $\arcsin(0.73) = 0.818321$ in radian mode. Report the value to the nearest hundredth and verify its range.

Your response: _____

AP Precalculus

Inverse Trigonometric Functions

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.

A student writes, "$\arccos(\cos(4\frac{\pi}{3})) = 4\frac{\pi}{3}$ because inverse functions cancel." Identify the failed condition and replace the conclusion with the correct principal angle.

A solution interprets $\sin^{-1}(\frac{1}{2})$ as the reciprocal $\frac{1}{\sin(\frac{1}{2})}$. Diagnose the notation error, rewrite the inverse with unambiguous notation, and evaluate it exactly.

A symbolic solution states $\tan(\arcsin u) = \frac{u}{\sqrt{1-u^2}}$ for $-1 \le u \le 1$. Repair the domain and explain what happens at $u = \pm 1$ in the original composition, not just in the formula.

A calculator returns 45 for $\arctan(1)$, and a student reports 45 radians. Diagnose the display and give the correct radian answer.

Inverse Trigonometric Functions

Full Worked Solutions - excerpt

Worked example

Problem. Use radian mode to approximate $\arccos(0.2)$ to three decimal places.

Answer. 1.369 radians

Explanation and check.

The calculator value $1.369438\ldots$ rounds to 1.369 radians.

Worked example

Problem. Find the domain of $G(x) = \arcsin(3 - x)$. Preserve the inequality reversal when isolating x.

Answer. $[2, 4]$

Explanation and check.

Require $-1 \le 3 - x \le 1$. The two bounds give $x \le 4$ and $x \ge 2$, hence $2 \le x \le 4$.

Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Solving Trigonometric Equations

Solving Trigonometric Equations | APPC-U03-P17

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for count by h-region, count by level case, count for each L, number of distinct solutions for each case, solution count by case and all roots.

8 PDFs and a README; 47 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.

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AP Precalculus

Solving Trigonometric Equations

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.

Solve $\sin x = \frac{1}{2}$ for $0 \le x \le 2\pi$. Use both unit-circle branches and check the endpoints. Bank label: _____	Solve $\sin(2x) = 0$ on $0 \le x \le \pi$. First map the x-interval to the complete $2x$-interval, then divide the enumerated angle values by 2. Bank label: _____
Solve $2\sin^2 x - 3\sin x + 1 = 0$ for $0 \le x \le 2\pi$. Treat $u = \sin x$, solve both feasible levels, and merge any overlapping angle sets. Bank label: _____	Find every x in $[0, 2\pi)$ satisfying $\sin x \cos x = 0$. Solve the two zero factors separately and combine without duplicating any root. Bank label: _____
Solve $\frac{\sin x}{1-\cos x}=0$ on $[0, 2\pi]$. Record denominator exclusions before using numerator-zero logic. Bank label: _____	Using $\sin^2 x = 1\text{-}\cos^2 x$, solve $\sin^2 x = 1\text{-}\cos x$ on $[0, 2\pi)$. Keep every root produced by the resulting factored equation. Bank label: _____
Solve $\cos x = -\frac{\sqrt{2}}{2}$ for $-\pi \le x < \pi$. Use the signed unit-circle interval rather than converting the final answers to $[0, 2\pi)$. Bank label: _____	Solve $\cos(x - \frac{\pi}{3}) = \frac{1}{2}$ on $[0, 2\pi]$. Enumerate every allowed angle $x - \frac{\pi}{3}$ in the mapped window, including boundary hits. Bank label: _____

AP Precalculus

Solving Trigonometric 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. Give the whole requested response, including any reasoning the question asks for.

Solve $2\sin x + 1 = 2$ for $0 \le x \le 2\pi$. Normalize the output before selecting sine branches.	For $\sin x = c$ on $[0, 2\pi)$, determine the solution count when $c = 1$, when $0 < \lvert c\rvert < 1$, when $c = -1$, and when $\lvert c\rvert > 1$. Base the count on intersections with the extrema.
Solve $-3\cos x + 2 = 5$ on $[0, 2\pi]$. After isolating cosine, use the extreme level to determine multiplicity.	Solve $\sqrt{1 - \cos x} = \sin x$ on $[0, 2\pi]$. After squaring, substitute every candidate into the original equation to enforce the nonnegative left side.
Solve $\sin x = 2$ on $[0, 2\pi]$. Give the range-based reason for your conclusion.	Solve $\sin^2 x = \sin x$ on $[0, 2\pi)$. Explain which solutions would disappear if both sides were divided by $\sin x$.

AP Precalculus

Solving Trigonometric 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: $\{0\}$

Solve $\tan(2x - \frac{\pi}{4}) = 1$ for $0 \le x \le \pi$. Filter the angle family $\frac{\pi}{4} + k\pi$ through the mapped window.

Your response: _____

Incoming: $[0, \frac{\pi}{2}]$ union $[3\frac{\pi}{2}, 2\pi]$

Solve $\sin^2 x - 2\sin x + 1 = 0$ on $[0, 2\pi]$. Explain why a repeated auxiliary root still produces a one-element angle set.

Your response: _____

Incoming: $\{0, \frac{\pi}{2}, \pi, 2\pi\}$

A nonnegative graph of $(\sin x - 0.6)^2$ on $[0, \pi]$ touches zero at two certified minima. Report both roots to the nearest thousandth and explain why sign-change bracketing detects neither.

Required response

0.643501109	0
2.498091545	0

Your response: _____

Incoming: $\{5\frac{\pi}{3}, 7\frac{\pi}{3}\}$

Solve $(2\sin x + 1)(2\sin x - 1) = 0$ on $[0, 2\pi)$. Enumerate the positive and negative half-levels separately.

Your response: _____

Incoming: $\{\frac{\pi}{4}, 5\frac{\pi}{4}\}$

Solve $\cos(-x + \frac{\pi}{6}) = \frac{\sqrt{3}}{2}$ on $[-\pi, \pi]$. Reverse the mapped interval correctly before filtering the two cosine branches.

Your response: _____

Incoming: $\{3.000\}$

Solve $\frac{\sin x}{\cos x} = 1$ on $[0, 2\pi)$. Preserve the cosine exclusions while using the equivalent tangent level where defined.

Your response: _____

AP Precalculus

Solving Trigonometric 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.

A student reports only $x = \frac{\pi}{3}$ for $\sin x = \frac{\sqrt{3}}{2}$ on $[0, 2\pi]$. Identify the missing branch and give the corrected complete set.

A student uses $a2\pi$ repeat and lists $\{-2\pi, 0, 2\pi\}$ for $\tan x = 0$ on $[-2\pi, 2\pi]$. Repair the period and include every missing root.

A solution lists both 0 and 2π for $\cos x = 1$ on $[0, 2\pi)$. Repair the set by applying the interval notation.

A solution factors $\sin^2 x + \sin x - 2 = 0$ but tries to include an angle for $\sin x = -2$. Remove the impossible auxiliary level and finish the solution on $[0, 2\pi]$.

Solving Trigonometric Equations

Full Worked Solutions - excerpt

Worked example

Problem. Solve $\cos x = -1$ on $-2\pi \le x \le 2\pi$. Filter the extreme-value family $\pi + 2k\pi$ through the symmetric interval.

Answer. $\{-\pi,\ \pi\}$

Explanation and check.

The family $x = \pi + 2k\pi$ yields $-\pi$ for $k = -1$ and π for $k = 0$. Adjacent values lie outside the interval.

Worked example

Problem. Solve $5\tan x + 2 = 2$ on $[-\pi, \pi]$. Apply tangent's $\pi-$spaced zero family to the closed endpoints.

Answer. $\{-\pi,\ 0,\ \pi\}$

Explanation and check.

The equation reduces to $\tan x = 0$, whose zeros $x = k\pi$ in the interval are $-\pi, 0, \pi$.

Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Trigonometric Inequalities

Trigonometric Inequalities | APPC-U03-P18

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for closed interval to tolerance, interval to tolerance, interval union to tolerance, correct intersection and counterexample, correct interval and boundary counterexample and correct set and boundary counterexample.

8 PDFs and a README; 111 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.

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AP Precalculus

Trigonometric Inequalities

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.

Certified numerical evidence locates the crossings of $\sin x$ and $0.2x + 0.1$ at 0.125411 and 2.498473 on $[0, 4]$. Solve the nonstrict inequality to the nearest thousandth.

Certified numerical evidence locates the crossings of $\sin x$ and $0.2x + 0.1$ at 0.125411 and 2.498473 on $[0, 4]$. Solve the nonstrict inequality to the nearest thousandth.

Supplied evidence	Value
equality points	0.125410601 2.498473192

Condition or evidence	Supplied value
Original inequality	$\sin x \geq 0.2x + 0.1$
Requested precision	nearest thousandth
Given shape evidence	the difference is nonnegative exactly between the crossings
Given window	$[0, 4]$

Bank label: _____

Solve $-2\cos x + 1 \leq 0$ on $[0, 2\pi)$. Show the order reversal caused by division by -2.

Solve $-2\cos x + 1 \leq 0$ on $[0, 2\pi)$. Show the order reversal caused by division by -2.

Condition or evidence	Supplied value
Original inequality	$-2\cos x + 1 \leq 0$
Input interval	$[0, 2\pi)$

Bank label: _____

Solve -sin($2x - \frac{\pi}{2}$) ≥ 0 on $[0, \pi]$. Track the output reversal before mapping the inner-angle intervals.

Solve -sin($2x - \frac{\pi}{2}$) ≥ 0 on $[0, \pi]$. Track the output reversal before mapping the inner-angle intervals.

Condition or evidence	Supplied value
Original inequality	-sin(2x-pi/2)>=0
Input interval	$[0, \pi]$

Bank label: _____

Solve $\sin x(1 + \cos x) \geq 0$ on $[0, 2\pi]$. Use that $1 + \cos x$ never becomes negative but does vanish at π.

Solve $\sin x(1 + \cos x) \geq 0$ on $[0, 2\pi]$. Use that $1 + \cos x$ never becomes negative but does vanish at π.

Condition or evidence	Supplied value
Original inequality	$\sin x(1 + \cos x) \geq 0$
Input interval	$[0, 2\pi]$

Bank label: _____

AP Precalculus

Trigonometric 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.

Solve $\sin x < 0$ OR $\cos x \le 0$ on $[0, 2\pi)$. Decide which boundaries are contributed by only one condition.

Solve $\sin x < 0$ OR $\cos x \le 0$ on $[0, 2\pi)$. Decide which boundaries are contributed by only one condition.

Condition or evidence	Supplied value
Given conditions	$\sin x < 0$ $\cos x \le 0$
Logical connective	OR
Input interval	$[0, 2\pi)$

During $0 \le t \le 12$ hours, a temperature follows $T(t) = 50 + 10\sin(\pi\frac{t}{6})$. When is $T > 55$, and for how many total hours?

During $0 \le t \le 12$ hours, a temperature follows $T(t) = 50 + 10\sin(\pi\frac{t}{6})$. When is $T > 55$, and for how many total hours?

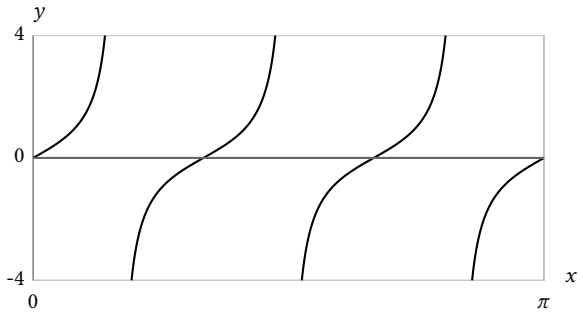
Condition or evidence	Supplied value
Required condition	$T > 55$
Given model	$T(t) = 50 + 10\sin(\pi\frac{t}{6})$
Time interval	$[0, 12]$ hours

For $0 \le t \le 10, V(t) = 12 + 4\cos(\pi\frac{t}{5})$. When is $V \le 8$, and what is the total duration?

For $0 \le t \le 10, V(t) = 12 + 4\cos(\pi\frac{t}{5})$. When is $V \le 8$, and what is the total duration?

Condition or evidence	Supplied value
Required condition	$V \le 8$
Given model	$V(t) = 12 + 4\cos(\pi\frac{t}{5})$
Time interval	$[0, 10]$ hours

Solve $\tan(3x) < 0$ on $[0, \pi]$, marking the three scaled poles before reading signs.



Condition or evidence	Supplied value
Original inequality	$\tan(3x) < 0$
Input interval	$[0, \pi]$

AP Precalculus

Trigonometric 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.

Incoming: $[0, 0.125] \cup [2.498, 4]$

Solve $\tan x \geq -\sqrt{3}$ on $[0, \pi)$, treating the two sides of $\frac{\pi}{2}$ as separate branches.

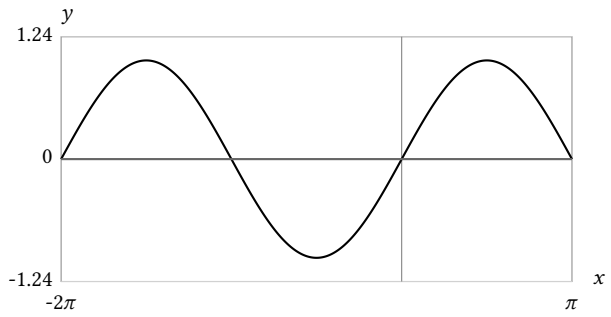
Solve $\tan x \geq -\sqrt{3}$ on $[0, \pi)$, treating the two sides of $\frac{\pi}{2}$ as separate branches.

Condition or evidence	Supplied value
Original inequality	$\tan x \geq -\sqrt{3}$
Input interval	$[0, \pi)$

Your response: _____

Incoming: $(\frac{\pi}{2}, \pi)$

Solve $\sin x \geq 0$ on $[-2\pi, \pi]$, using signed cycles and all equality zeros.



Condition or evidence	Supplied value
Original inequality	$\sin x \geq 0$
Input interval	$[-2\pi, \pi]$

Your response: _____

Incoming: $[-2\pi, \pi]$

Let $\alpha = \arccos(0.2)$. Solve $\cos x \leq 0.2$ on $[0, 2\pi)$ in terms of α.

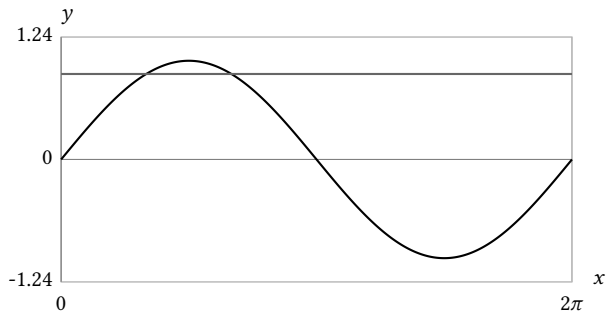
Let $\alpha = \arccos(0.2)$. Solve $\cos x \leq 0.2$ on $[0, 2\pi)$ in terms of α.

Condition or evidence	Supplied value
Original inequality	$\cos x \leq 0.2$
Input interval	$[0, 2\pi)$

Your response: _____

Incoming: $[-2, 2]$

Solve $\sin x > \frac{\sqrt{3}}{2}$ on $[0, 2\pi]$.



Condition or evidence	Supplied value
Original inequality	$\sin x > \frac{\sqrt{3}}{2}$
Input interval	$[0, 2\pi]$

Your response: _____

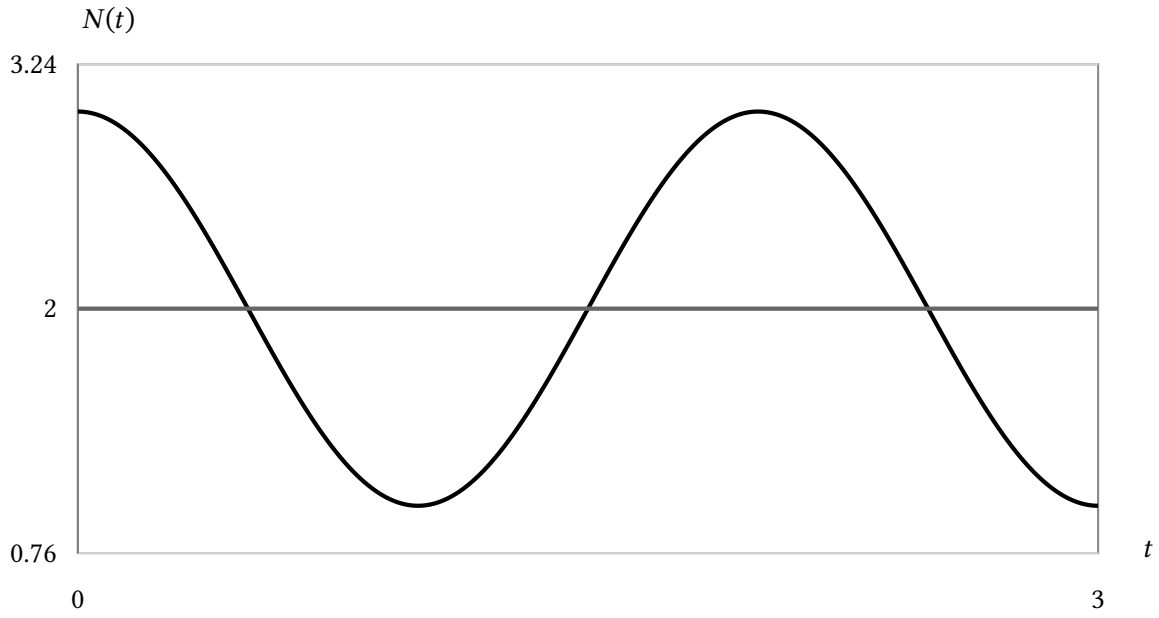
AP Precalculus

Trigonometric 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.

For $0 \le t \le 3, N(t) = 2 + \cos(\pi t)$. Find when $N > 2$ and add the unequal visible window lengths. First choose and justify a valid method. Method A: Add the actual lengths of the two admitted time windows. Method B: Multiply the number of windows by a common assumed length.



Condition or evidence	Supplied value
Required condition	$N > 2$
Given model	$N(t) = 2 + \cos(\pi t)$
Time interval	$[0, 3]$ hours

Trigonometric Inequalities

Full Worked Solutions - excerpt

Worked example

Problem. Determine the solution set of $\cos x > 1$ on $[0, 2\pi]$ without solving an equality first.

Determine the solution set of $\cos x > 1$ on $[0, 2\pi]$ without solving an equality first.

Condition or evidence	Supplied value
Original inequality	$\cos x > 1$
Input interval	$[0, 2\pi]$

Answer. $\varnothing$

Explanation and check.

Cosine's maximum value is 1, so it can never be strictly greater than 1. The solution set is empty.

Worked example

Problem. Solve $-3\sin x + 2 < -1$ on $[0, 2\pi]$, reversing the inequality when the sine term is isolated.

Solve $-3\sin x + 2 < -1$ on $[0, 2\pi]$, reversing the inequality when the sine term is isolated.

Condition or evidence	Supplied value
Original inequality	$-3\sin x + 2 < -1$
Input interval	$[0, 2\pi]$

Answer. $\varnothing$

Explanation and check.

Isolation gives $\sin x > 1$. Since the upper endpoint of sine's range is 1, the strict inequality is impossible.