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

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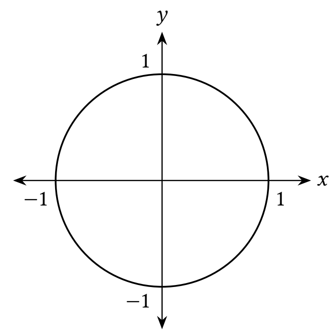
Name: ______________ **Date:** ______________ **Class:** ______________

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: ______

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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.

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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.

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: ______________________

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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.

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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.