

Watch. Practice. Understand. | Lesson 211

Pre-Cal Chapter 7 Trigonometric Identities and Inverse Functions Sample Test Problems

Watch the matching video: <https://www.youtube.com/watch?v=txBxEJ6iv1s>

Practice focus: Fundamental trigonometric identities

Related course review; confirm topics with your teacher.

Name: _____ Date: _____ Show your reasoning and check units.

01 Simplify $(1 - \cos^2 x)/\sin x$ wherever defined.

02 Prove $(\sec x - \cos x)/\tan x = \sin x$ on its domain.

03 Simplify $(1 + \tan^2 x)\cos^2 x$ wherever defined.

04 A student claims $\sin(a + b) = \sin a + \sin b$. Give a counterexample.

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Name: _____ Date: _____ Show your reasoning and check units.

05 Evaluate $\arcsin(1/2)$, $\arccos(-1/2)$, and $\arctan(-1)$. Use principal values.

06 Evaluate $\arcsin(\sin(5\pi/6))$.

07 Evaluate $\cos(\arctan(3/4))$.

08 Solve $\sin x = 1/2$ on $0 \leq x < 2\pi$.

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Practice focus: Trigonometric equations

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Name: _____ Date: _____ Show your reasoning and check units.

09 Solve $2\cos x - 1 = 0$ on $0 \leq x < 2\pi$.

10 Solve $2\sin^2 x - \sin x = 0$ on $0 \leq x < 2\pi$.

11 Solve $\tan x = -1$ for all real x .

12 Solve $\cos 2x = \cos x$ on $0 \leq x < 2\pi$.

Worked answers | Lesson 211

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01 Simplify $(1 - \cos^2 x)/\sin x$ wherever defined.

Use $1 - \cos^2 x = \sin^2 x$; result $\sin x$ for $\sin x \neq 0$.

02 Prove $(\sec x - \cos x)/\tan x = \sin x$ on its domain.

Numerator $= (1 - \cos^2 x)/\cos x = \sin^2 x/\cos x$. Divide by $\sin x/\cos x$ to obtain $\sin x$.

03 Simplify $(1 + \tan^2 x)\cos^2 x$ wherever defined.

$1 + \tan^2 x = \sec^2 x$, so the expression equals 1.

04 A student claims $\sin(a + b) = \sin a + \sin b$. Give a counterexample.

Take $a = b = \pi/2$. Left side $\sin \pi = 0$, right side $1 + 1 = 2$. The identity is false.

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05 Evaluate $\arcsin(1/2)$, $\arccos(-1/2)$, and $\arctan(-1)$. Use principal values.

$\pi/6$, $2\pi/3$, and $-\pi/4$ respectively, using the principal-value ranges.

06 Evaluate $\arcsin(\sin(5\pi/6))$.

$\arcsin$ outputs values in $[-\pi/2, \pi/2]$. Since $\sin(5\pi/6) = 1/2$, the result is $\pi/6$.

07 Evaluate $\cos(\arctan(3/4))$.

Take a right triangle with opposite 3, adjacent 4, hypotenuse 5. Cosine is $4/5$.

08 Solve $\sin x = 1/2$ on $0 \leq x < 2\pi$.

Unit-circle solutions in quadrants I and II: $x = \pi/6, 5\pi/6$. Inverse sine alone gives only the first.

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09 Solve $2\cos x - 1 = 0$ on $0 \leq x < 2\pi$.

$\cos x = 1/2$, so $x = \pi/3$ or $5\pi/3$.

10 Solve $2\sin^2 x - \sin x = 0$ on $0 \leq x < 2\pi$.

$\sin x(2\sin x - 1) = 0$. Solutions: $0, \pi, \pi/6, 5\pi/6$.

11 Solve $\tan x = -1$ for all real x .

Tangent has period π : $x = -\pi/4 + k\pi$ for any integer k .

12 Solve $\cos 2x = \cos x$ on $0 \leq x < 2\pi$.

$2\cos^2 x - 1 = \cos x$ gives $(2\cos x + 1)(\cos x - 1) = 0$. Solutions: $0, 2\pi/3, 4\pi/3$.