LESSON MAKER PRO

Six Curve Quest

Read, sketch, and compare trig graphs

HIGH SCHOOL · PC.T.1.8

PC.T.1.8 "Graph all six trigonometric functions, identifying key features."

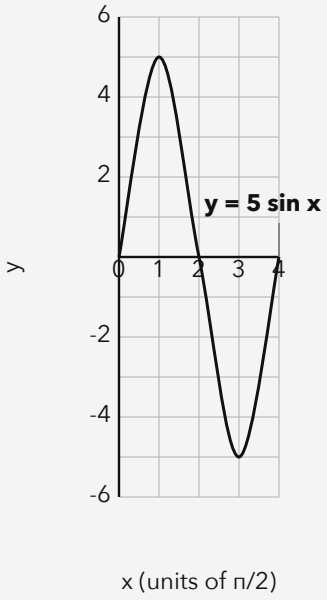
NAME _____ DATE _____

FROM ANGLES TO GRAPHS

On these grids, each horizontal unit represents π/2 radians. A period is the horizontal distance before a graph repeats. Sine and cosine have an amplitude equal to half the distance from their lowest value to their highest value. Tangent, cotangent, secant, and cosecant have vertical asymptotes where their values are undefined.

WORKED EXAMPLE

Use the graph of y = 5 sin x to find its amplitude and period.

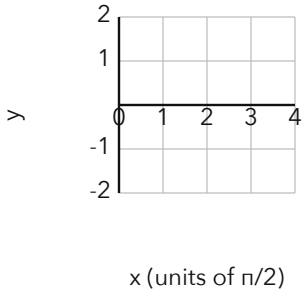


1. Read the highest and lowest values: 5 and -5.
2. Amplitude = (5 - (-5))/2 = 5.
3. One full cycle spans 4 horizontal units, so the period is 4(π/2) = 2π.

Answer: Amplitude: 5; period: 2π.

PRACTICE Problems 1–2

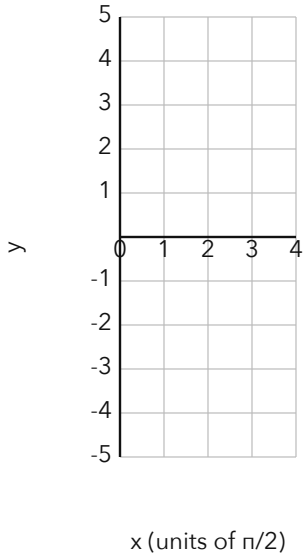
1 Sketch y = sin x for 0 ≤ x ≤ 2π. Label its intercepts, maximum and minimum; state its period.



ANSWER _____

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2 Sketch y = 4 cos x for 0 ≤ x ≤ 2π. Label its intercepts and turning points; state its amplitude and period.

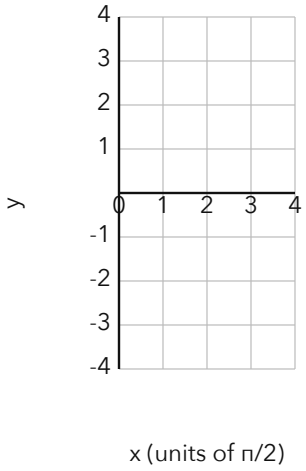


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PRACTICE Problems 3–4

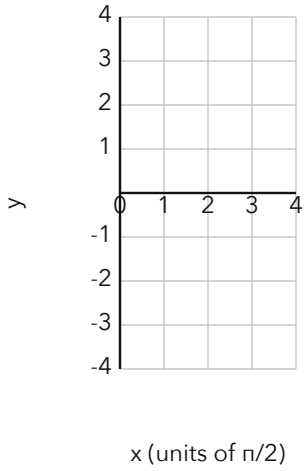
3 Sketch y = tan x on the grid from x = 0 to x = 2π. Label its x-intercepts and vertical asymptotes.



ANSWER _____

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4 Sketch y = cot x for 0 < x < 2π. Label its intercepts and vertical asymptotes; state its period.

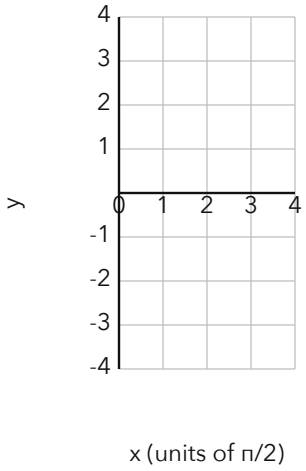


ANSWER _____

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PRACTICE Problems 5–6

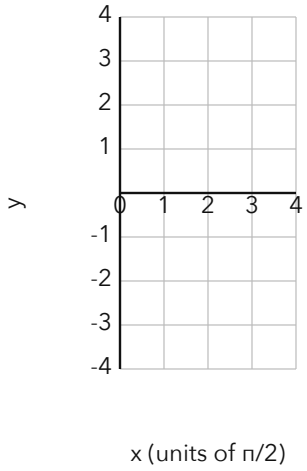
5 Sketch y = sec x on the grid from x = 0 to x = 2π. Label its vertical asymptotes and the lowest or highest point of each branch.



ANSWER _____

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6 Sketch y = csc x on the grid from x = 0 to x = 2π. Label its vertical asymptotes and the lowest or highest point of each branch.

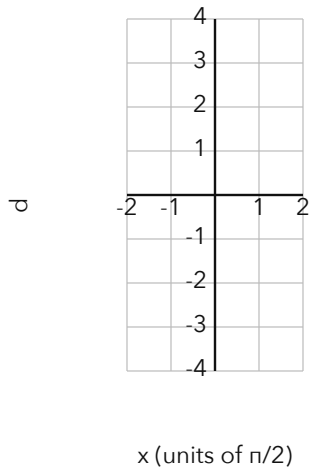


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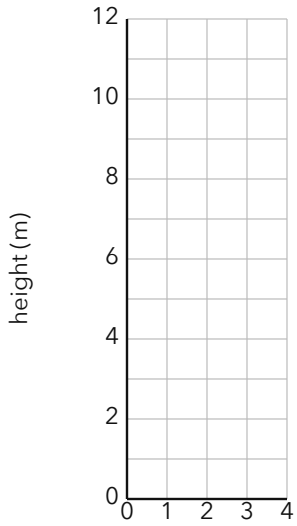
APPLY IT Show your work

1 In a video game, a camera's horizontal offset is d(x) = 6 tan x, where x is its viewing angle and -π/2 < x < π/2. On the grid, mark the two angle boundaries where the magnitude |d(x)| grows without bound.



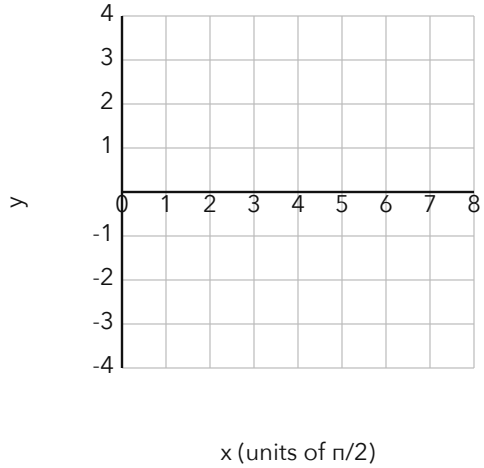
ANSWER _____

2 A seat on a rotating ride has height h(x) = 7 + 3 cos x meters above the platform, where x is its angle in radians. Sketch its height on the grid for 0 ≤ x ≤ 2π. What is its greatest height, and at which angles in this interval does it reach that height?



ANSWER _____

CHALLENGE One step up



Sketch y = 1 + 2 tan(x/2) on the grid for 0 ≤ x ≤ 4π. Label its vertical asymptotes and state its period. Explain how you found both.

WORK SPACE AND ANSWER

Six Curve Quest

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Sketch y = sin x for 0 ≤ x ≤ 2π. Label its intercepts, maximum and minimum; state its period.	**Smooth curve through (0,0), (π/2,1), (π,0), (3π/2,-1), (2π,0). Maximum 1; minimum -1; period 2π.**
2	Sketch y = 4 cos x for 0 ≤ x ≤ 2π. Label its intercepts and turning points; state its amplitude and period.	**Smooth curve through (0,4), (π/2,0), (π,-4), (3π/2,0), (2π,4). Amplitude 4; period 2π.**
3	Sketch y = tan x on the grid from x = 0 to x = 2π. Label its x-intercepts and vertical asymptotes.	**x-intercepts: 0, π, 2π. Vertical asymptotes: x = π/2 and x = 3π/2. Draw increasing branches between the asymptotes.**
4	Sketch y = cot x for 0 < x < 2π. Label its intercepts and vertical asymptotes; state its period.	**Decreasing branches on (0,π) and (π,2π), with intercepts π/2 and 3π/2. Vertical asymptotes x=0, π, 2π; period π.**
5	Sketch y = sec x on the grid from x = 0 to x = 2π. Label its vertical asymptotes and the lowest or highest point of each branch.	**Vertical asymptotes: x = π/2 and x = 3π/2. Branch turning points: (0, 1), (π, -1), and (2π, 1); the positive branches rise toward their asymptotes, and the negative branch falls toward them.**
6	Sketch y = csc x on the grid from x = 0 to x = 2π. Label its vertical asymptotes and the lowest or highest point of each branch.	**Vertical asymptotes: x = 0, x = π, and x = 2π. Branch turning points: (π/2, 1) and (3π/2, -1); the positive branch rises toward its asymptotes, and the negative branch falls toward them.**

PART 2 · APPLY IT

1. **x = -π/2 and x = π/2.** Tangent has vertical asymptotes where cos x = 0. At both boundaries of the given interval, the magnitude of 6 tan x grows without bound.
2. **Greatest height: 10 meters, at x = 0 and x = 2π. The curve passes through (0, 10), (π/2, 7), (π, 4), (3π/2, 7), and (2π, 10).** Cosine reaches 1 at both endpoints of the interval, giving h = 7 + 3(1) = 10. Use the quarter-cycle angles to sketch the smooth curve.

CHALLENGE

Vertical asymptotes: x = π and x = 3π; period: 2π. The expression x/2 reaches π/2 and 3π/2 at those asymptotes. It must increase by π for tangent to repeat, so x increases by 2π. The sketch has increasing branches passing through (0, 1), (2π, 1), and (4π, 1), with breaks at the asymptotes.

Accept freehand curves with the correct branches, labeled features, and behavior near asymptotes. Coordinates on every grid use one horizontal unit for π/2 radians.