Graphing Two Sinusoids

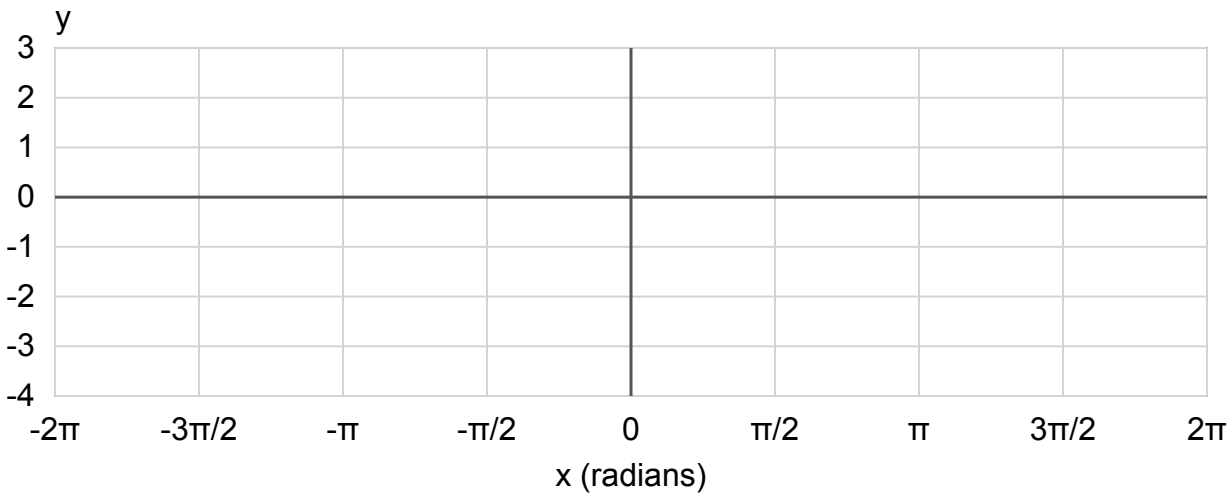
Find and graph amplitude, period, midline, extrema, and intercepts

Name: _____ Date: _____

Part 1 - Plan and graph f(x)

Use radians. The x-axis labels are exact multiples of pi. Complete the feature table, then plot key points and draw a smooth curve for **f(x) = 2 sin(x) - 1**.

Feature	f(x) = 2 sin(x) - 1	g(x) = -cos(2(x - pi/2)) + 1
Amplitude		
Period		
Midline		



Record f's key features. List all points in the displayed window.

Maximum point(s):

Minimum point(s):

y-intercept and x-intercept(s):

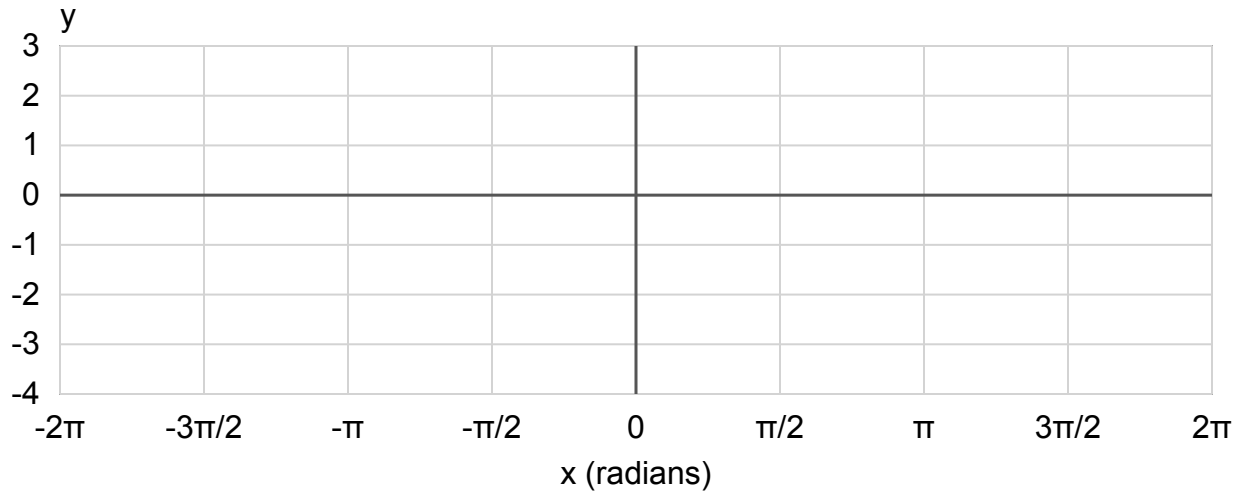
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Name: _____ Date: _____

Part 2 - Graph g(x) and compare

Plot key points and draw a smooth curve for **g(x) = -cos(2(x - pi/2)) + 1**. Use the amplitude, period, and midline from Part 1 to check your graph.



Record g's key features. List all points in the displayed window.

Maximum point(s):

Minimum point(s) and x-intercept(s):

y-intercept:

Compare the functions. Write one similarity and two differences. Use the words amplitude, period, and midline. Explain why g completes more cycles than f on the same x-interval.

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Answer key and teaching notes

Materials and setup

Supplied: two trig-scaled blank axes labeled -2π, -3π/2, -π, -π/2, 0, π/2, π, 3π/2, and 2π; a feature table; and response lines. Additionally needed: pencil, ruler, and an optional graphing calculator for checking only. Print and supply all student pages, keeping teacher-key pages separate. Tell students that the labeled x-axis intervals are π/2 and that graphs must be smooth curves through calculated key points, not connect-the-dot zigzags.

Teaching script

Say: “The number before sine or cosine changes vertical distance from the midline. The number multiplying x changes how quickly the cycle repeats. First identify the midline and amplitude. Then use quarter-period points to sketch one cycle and continue the pattern.” Say: “For intercepts, set the function equal to zero and keep only solutions shown on this graph.”

Observation method

As students work, inspect the feature table first and then the plotted curves. Look for a horizontal midline, correctly spaced extrema, intercepts within the displayed interval, and smooth periodic repetition. Ask a student who has an error: “What is your quarter-period?” Accept equivalent ordered point lists and intercepts written in exact radian form. Do not require decimal approximations.

1. f(x) = 2 sin(x) - 1

Amplitude: 2. Period: 2π. Midline: y = -1. Maximum points in the window: (-3π/2, 1) and (π/2, 1). Minimum points: (-π/2, -3) and (3π/2, -3). y-intercept: (0, -1). For x-intercepts, 2 sin(x) - 1 = 0, so sin(x) = 1/2. In the shown window: (-11π/6, 0), (-7π/6, 0), (π/6, 0), and (5π/6, 0). Useful plotted points: (-2π, -1), (-3π/2, 1), (-π, -1), (-π/2, -3), (0, -1), (π/2, 1), (π, -1), (3π/2, -3), (2π, -1).

2. g(x) = -cos(2(x - π/2)) + 1

This simplifies to cos(2x) + 1. Amplitude: 1. Period: π. Midline: y = 1. Maximum points: (-2π, 2), (-π, 2), (0, 2), (π, 2), (2π, 2). Minimum points: (-3π/2, 0), (-π/2, 0), (π/2, 0), (3π/2, 0). The minimum points are also the x-intercepts. y-intercept: (0, 2). A correct curve repeats every π and stays from y = 0 through y = 2.

3. Comparison rubric

Sample response: “Both functions are sinusoidal and repeat. f has amplitude 2, while g has amplitude 1. The period of f is 2π, while the period of g is π. Their midlines are y = -1 and y = 1. g completes more cycles because the factor 2 multiplying x halves the basic cosine period.” Award full credit when the response accurately states one similarity, two feature differences, and connects the factor 2 to g's shorter period.

Source credit

New York Next Generation Mathematics Standard AII-F.IF.7.e, “Graph cube root, exponential and logarithmic functions... and trigonometric functions, showing period, midline, and amplitude.”
https://lessonmakerpro.com/standards/ny-nextgen-math/aii-f-if-7-e