

Function Graph Signals

Sketch functions and show what their graphs reveal.

HIGH SCHOOL • HSF-IF.C.7e

CCSS.Math.Content.HSF-IF.C.7e "Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude."

NAME _____

DATE _____

FROM FEATURES TO GRAPHS

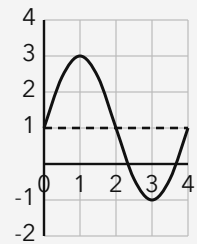
Plot intercepts and useful points, then connect smoothly. Show asymptotes with dashed lines. For $y = a \sin(bx) + d$ or $y = a \cos(bx) + d$, amplitude is $|a|$, midline is $y = d$, and period is $2\pi/|b|$ (radians). Each grid step is one unit. Sketch within the window and describe continuation beyond it.

WORKED EXAMPLE

Graph $y = 2 \sin(\pi x/2) + 1$ for $0 \leq x \leq 4$.

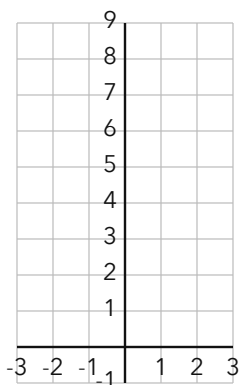
1. Amplitude = 2; midline $y = 1$; period = 4.
2. Plot $(0, 1)$, $(1, 3)$, $(2, 1)$, $(3, -1)$, $(4, 1)$.
3. Connect with a smooth wave. Draw the dashed midline.

Answer: One full cycle; maximum 3 and minimum -1.



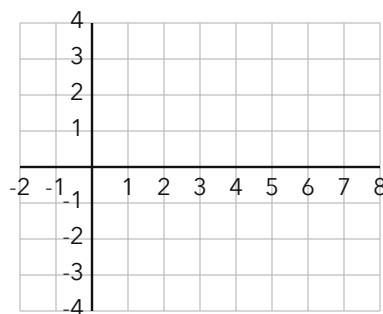
PRACTICE 4 problems

- 1** Graph $f(x) = 2^x + 1$. Label the intercept, draw its horizontal asymptote, and describe both ends as x increases or decreases without bound.



ANSWER _____

- 2** Graph $g(x) = \log_2(x + 1)$. Label the intercept, draw its vertical asymptote, and describe behavior near that asymptote and as x increases without bound.



ANSWER _____

- 3** For $h(x) = -3 \cos(\pi x/3) + 4$, find amplitude, midline, and period. For the cycle $0 \leq x \leq 6$, give its starting point and maximum point.

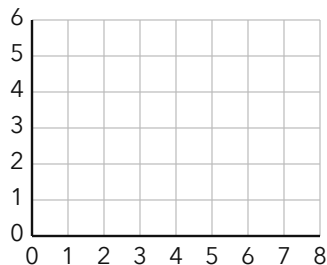
ANSWER _____

- 4** For $p(x) = 4 \sin(\pi x/5) + 6$, find amplitude, midline, and period. List its maximum and minimum values.

ANSWER _____

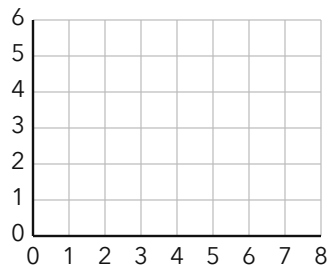
APPLY IT Show your work

- 1** A floating marker's height is modeled by $H(t) = 2 \sin(\pi t/2) + 3$ meters. Graph $0 \leq t \leq 8$ seconds (horizontal t , vertical H). Mark the midline, amplitude, and one period.



ANSWER _____

- 2** A ride seat's height is modeled by $R(t) = -2 \cos(\pi t/4) + 3$ meters. Graph $0 \leq t \leq 8$ seconds (horizontal t , vertical R). Mark the midline, amplitude, and one period.



ANSWER _____

CHALLENGE One step up

A student says, "The graph of $2^x + 1$ crosses the line $y = 1$ far enough to the left, and $\log_2(x + 1)$ crosses the line $x = -1$ far enough down." Explain why each claim is false. Use the domain or range of each function.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Graph $f(x) = 2^x + 1$. Label the intercept, draw its horizontal asymptote, and describe both ends as x increases or decreases without bound.	(0, 2); no x-intercept. Asymptote $y = 1$. As $x \rightarrow \infty$, $f(x) \rightarrow \infty$; as $x \rightarrow -\infty$, $f(x) \rightarrow 1$ from above.
2	Graph $g(x) = \log_2(x + 1)$. Label the intercept, draw its vertical asymptote, and describe behavior near that asymptote and as x increases without bound.	Both intercepts: (0, 0). Asymptote $x = -1$. As $x \rightarrow -1$ from the right, $g(x) \rightarrow -\infty$; as $x \rightarrow \infty$, $g(x) \rightarrow \infty$. Points (1, 1), (3, 2), (7, 3).
3	For $h(x) = -3 \cos(\pi x/3) + 4$, find amplitude, midline, and period. For the cycle $0 \leq x \leq 6$, give its starting point and maximum point.	Amplitude 3, midline $y = 4$, period 6. Starts (0, 1); maximum (3, 7) in the first cycle.
4	For $p(x) = 4 \sin(\pi x/5) + 6$, find amplitude, midline, and period. List its maximum and minimum values.	Amplitude 4, midline $y = 6$, period 10. Maximum 10; minimum 2.

PART 2 • APPLY IT

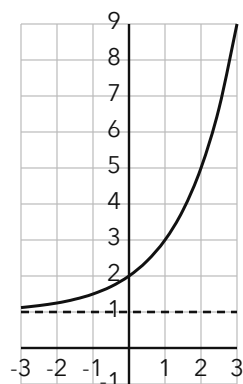
- Midline $H = 3$ m, amplitude 2 m, period 4 s; two cycles.** Plot (0,3), (1,5), (2,3), (3,1), (4,3), (5,5), (6,3), (7,1), (8,3). Connect smoothly; dashed midline at 3.
- Midline $R = 3$ m, amplitude 2 m, period 8 s; one cycle.** Plot (0,1), (2,3), (4,5), (6,3), (8,1). Connect smoothly with a minimum at each endpoint; dashed midline at 3.

CHALLENGE

2^x is positive for every real x , so $2^x + 1$ has range $y > 1$ and never reaches $y = 1$. A logarithm requires $x + 1 > 0$, so the second graph exists only for $x > -1$ and never reaches or crosses $x = -1$.

Accept smooth sketches through the listed points and correct feature labels; plotted dots alone are incomplete. Grids show finite windows. Sample exponential/logarithmic curves are on the next key page; they continue beyond the window as described. Check both applied trigonometric sketches using their quarter-period points.

PRACTICE 1 · SAMPLE FIGURE



PRACTICE 2 · SAMPLE FIGURE

