LESSON MAKER PRO

Waves on Graphs

Read and build graphs of repeating functions

HIGH SCHOOL · PC.F.B.26

PC.F.B.26 "Graph functions expressed symbolically and show key features of the graph, by hand and using technology. Use the equation of functions to identify key features in order to generate a graph. a. Graph rational functions..."

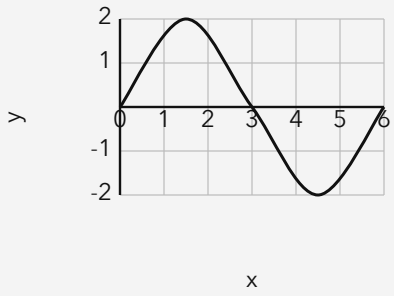
NAME _____ **DATE** _____

THE BIG IDEA

For y = A sin(B(x - C)) + D or y = A cos(B(x - C)) + D, the amplitude is |A|, the midline is y = D, and the period is 2π/|B|. The phase shift is C. To plan a graph, find five points spaced one-quarter period apart.

WORKED EXAMPLE

Use the curve to find its midline, amplitude, and period.



1. The highest value is 2, and the lowest is -2.
2. Midline: y = (2 + (-2))/2 = 0.
3. Amplitude: (2 - (-2))/2 = 2. One full cycle runs from x = 0 to x = 6.

Answer: Midline: y = 0; amplitude: 2; period: 6.

PRACTICE 4 problems

1 For y = 3 sin(πx/4) + 1, find the amplitude and period.

ANSWER _____

2 For y = 4 cos(πx/2) - 3, find the midline and five quarter-cycle points starting at x = 0.

ANSWER _____

3 For y = 5 sin(π(x - 3)/4) + 2, find the phase shift and period.

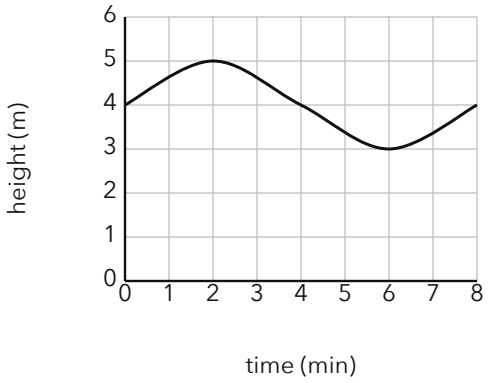
ANSWER _____

4 For y = -4 sin(πx/2) + 3, list five quarter-cycle points starting at x = 0.

ANSWER _____

APPLY IT Show your work

1 A fair ride seat follows the height graph. Find its amplitude and period.



ANSWER _____

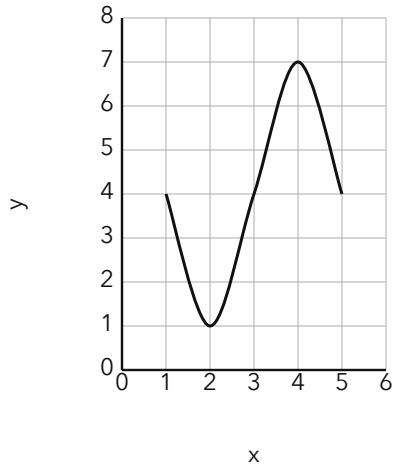
2 A drone's height is $h(t) = 7 + 4\cos(\pi t/5)$ meters, where t is seconds. Find its midline height and the time from its highest point to its lowest.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Write a sine equation for this curve that starts at x = 1 on its midline. Explain why the sine coefficient is negative.



WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For y = 3 sin(πx/4) + 1, find the amplitude and period.	**Amplitude: 3; period: 8.**
2	For y = 4 cos(πx/2) - 3, find the midline and five quarter-cycle points starting at x = 0.	**Midline: y = -3; points: (0, 1), (1, -3), (2, -7), (3, -3), (4, 1).**
3	For y = 5 sin(π(x - 3)/4) + 2, find the phase shift and period.	**Phase shift: 3 units right; period: 8.**
4	For y = -4 sin(πx/2) + 3, list five quarter-cycle points starting at x = 0.	**(0, 3), (1, -1), (2, 3), (3, 7), (4, 3).**

PART 2 · APPLY IT

1. **Amplitude: 1 m; period: 8 min.** The height ranges from 3 m to 5 m, so the amplitude is 1 m. The graph completes one cycle from 0 to 8 minutes.
2. **Midline height: 7 m; time from highest to lowest: 5 s.** The constant term gives a midline of 7 m. The period is 10 s, and the trip from highest to lowest takes half a period.

CHALLENGE

y = -3 sin(π(x - 1)/2) + 4. The curve falls below its midline just after x = 1, so the sine coefficient is negative.

Accept equivalent equations for the challenge if they match the curve and explain its initial decrease. Point lists must follow the requested x-values in order.