

Graph Feature Sprint

Find the key features that shape each graph.

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 _____

GRAPH CLUES

For $y = a \sin(bx) + d$ or $y = a \cos(bx) + d$, the amplitude is $|a|$, the midline is $y = d$, and the period is $2\pi/|b|$. An exponential graph has a y-intercept and a horizontal asymptote, while a logarithmic graph has an x-intercept and a vertical asymptote.

WORKED EXAMPLE

For $y = 4 \cos(5x) - 6$, find the amplitude, midline, period, and y-intercept.

1. Amplitude = $|4| = 4$.
2. Midline: $y = -6$.
3. Period = $2\pi/5$.
4. At $x = 0$, $y = 4 \cos(0) - 6 = -2$.

Answer: Amplitude: 4; midline: $y = -6$; period: $2\pi/5$; y-intercept: (0, -2)

PRACTICE 5 problems

- 1** For $y = 7^x - 8$, give the y-intercept, horizontal asymptote, and end behavior.

ANSWER _____

- 2** For $y = \log_3(x + 10)$, give the x-intercept and vertical asymptote.

ANSWER _____

- 3** For $y = -11 \cos(x) + 12$, give the amplitude, midline, and period.

ANSWER _____

- 4** For $y = \sin(13x) + 14$, give the amplitude, midline, and period.

ANSWER _____

- 5** For $y = (1/15)^x - 16$, give the y-intercept, horizontal asymptote, and end behavior.

ANSWER _____

APPLY IT Show your work

- 1** A music app models the height of a visualizer bar with $h(t) = 18 \sin(\pi t/12) + 20$, where t is in seconds. Find the amplitude, midline, period, maximum height, and minimum height.

WORK SPACE

ANSWER _____

- 2** A student club models the number of video shares, F , after d days by $F(d) = 21(3^d)$. Identify the y -intercept, horizontal asymptote, and end behavior of the graph.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A sound wave crosses its midline while rising at $x = 0$. Its maximum is 25, its minimum is -3, and its period is 14π . Write a sine equation for the wave.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	For $y = 7^x - 8$, give the y-intercept, horizontal asymptote, and end behavior.	y-intercept: (0, -7); horizontal asymptote: $y = -8$; as $x \rightarrow \infty$, $y \rightarrow \infty$; as $x \rightarrow -\infty$, $y \rightarrow -8$.
2	For $y = \log_3(x + 10)$, give the x-intercept and vertical asymptote.	x-intercept: (-9, 0); vertical asymptote: $x = -10$.
3	For $y = -11 \cos(x) + 12$, give the amplitude, midline, and period.	Amplitude: 11; midline: $y = 12$; period: 2π.
4	For $y = \sin(13x) + 14$, give the amplitude, midline, and period.	Amplitude: 1; midline: $y = 14$; period: $2\pi/13$.
5	For $y = (1/15)^x - 16$, give the y-intercept, horizontal asymptote, and end behavior.	y-intercept: (0, -15); horizontal asymptote: $y = -16$; as $x \rightarrow \infty$, $y \rightarrow -16$; as $x \rightarrow -\infty$, $y \rightarrow \infty$.

PART 2 • APPLY IT

- Amplitude: 18; midline: $h = 20$; period: 24 seconds; maximum: 38; minimum: 2.** The amplitude is 18 and the midline is 20. The period is $2\pi/(\pi/12) = 24$, so the maximum and minimum are $20 + 18$ and $20 - 18$.
- y-intercept: (0, 21); horizontal asymptote: $y = 0$; as $d \rightarrow \infty$, $F(d) \rightarrow \infty$; as $d \rightarrow -\infty$, $F(d) \rightarrow 0$.**
At $d = 0$, $F(0) = 21$. Because the base is greater than 1, the graph increases to the right and approaches zero to the left.

CHALLENGE

$$y = 14 \sin(x/7) + 11$$

Accept equivalent notation for end behavior and intercepts. For the challenge, accept equivalent sine equations with a phase shift of any whole number of periods.