Topic 7.4 Exponential Models

Essential Question:

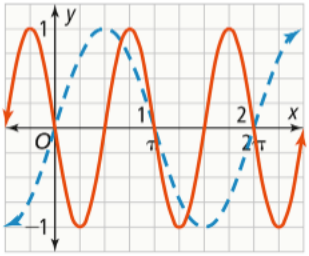
How can you identify key features of sine and cosine functions?

Concept:

Frequency is the reciprocal of the period.

$y = \sin x$ and $y = \cos x$ each have a period of 2π and a frequency of $\frac{1}{2\pi}$. The function repeats itself one time from 0 to 2π.

$y = -\sin 2x$ has a period of π, and a frequency of $\frac{1}{\pi}$. The function repeats itself one time from 0 to π.



CONCEPT Summary

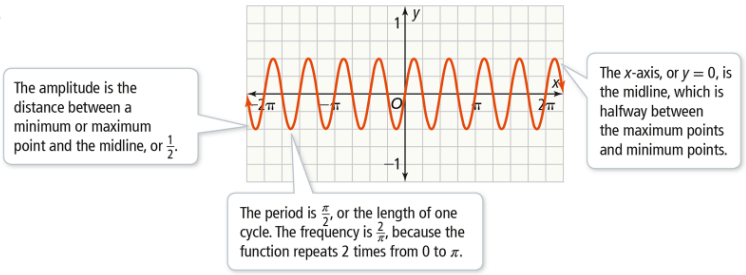
Key Features of Sine and Cosine Graphs

WORDS

The general equation for a sine function is $y = a \sin bx$, just as the general equation for a cosine function is $y = a \cos bx$. In both cases, the amplitude is $|a|$ and the frequency is $\frac{b}{2\pi}$.

The equation for the graph below is $y = \frac{1}{2} \sin 4x$.

GRAPH



Q: Why is the absolute value used in the expression for the amplitude of the function?

Practice and Problem Solving

Complete MathXL for School: Enrichment (online)
Complete MathXL for School: Enrichment (online)

Challenge: #12, 19, 20, 23 – key will be posted in Power School Learning.

7.4 Quiz/Notes:

Examples & Questions

Examples 1

Part A:

Q: Can you choose any point as the starting point of the period?

Q: What do you notice about the *y*-values in each period?

Part B:

Q: How are the minimum and maximum of the function $y = \sin x$ related?

Q: Why do the minimum and maximum values repeat every 2π radians?

Examples 2

Part A:

Q: How is the amplitude related to other transformations of functions you have previously studied?

Part B:

Q: Why does the negative sign in the function $y = -\sin 2x$ not affect the amplitude of the function?

Q: Under what conditions would the coefficient of *x* make the period longer?

Examples 3

Part A:

Q: How can you determine the key points for the graphs of functions of the form $y = a \sin bx$ and $y = \mathrm{a} \cos bx$?

Part B:

Q: The average rate of change is positive and negative over different intervals in the period. What does this tell you about the graph of the function?

Examples 4

Q: How can you determine the middle of a graph if you are given the minimum and maximum values of the function?

Q: How does the movement of the hour hand on the clock correspond to the graph of the function?

Examples 5

Q: How can the period of a trigonometric function be determined by its graph?

Q: How would the graph of *f* compare to the graph of *g?*

Q: How would the equation of *g* compare to the equation of *f*?