4.1 Graphs of the Sine and Cosine Functions

Match the function with its graph.

1) \( y = \sin x \)  
2) \( y = \cos x \)  
3) \( y = -\sin x \)  
4) \( y = -\cos x \)

A)  
B)  
C)  
D)
2) \( y = \sin 3x \)  
3) \( y = 3 \sin x \)  
4) \( y = \cos 3x \)
3) 1) \( y = \sin \frac{1}{2}x \)  
2) \( y = \frac{1}{2} \cos x \)
3) \( y = \frac{1}{2} \sin x \)  
4) \( y = \cos \frac{1}{2}x \)

Give the amplitude or period as requested.
4) Amplitude of \( y = -4 \sin x \)

5) Amplitude of \( y = 3 \cos \frac{1}{4}x \)

6) Period of \( y = \cos 5x \)

7) Period of \( y = 3 \cos \frac{1}{4}x \)
The function graphed is of the form \( y = a \sin bx \) or \( y = a \cos bx \), where \( b > 0 \). Determine the equation of the graph.

8) 

9) 

10)
Solve the problem.

11) The voltage E in an electrical circuit is given by $E = 4.4 \cos 60\pi t$, where $t$ is time measured in seconds. Find the frequency of the function (that is, find the number of cycles or periods completed in one second).

12) The total sales in dollars of some small businesses fluctuates according to the equation $S = A + B \sin \pi x / 6$, where $x$ is the time in months, with $x = 1$ corresponding to January, $A = 6700$, and $B = 4000$. Determine the month with the greatest total sales and give the sales in that month.

4.5 Simple Harmonic Motion

13) Write a function $s(t)$ that describes the simple harmonic motion of a particle moving uniformly around a circle of radius 8 units, with angular speed 6 radians per second, if $s(0) = 0$.

14) The formula for the up and down motion of a weight on a spring is given by $s(t) = \sin \sqrt{\frac{k}{m}} t$. If the spring constant is 3, then what mass $m$ must be used in order to produce a period of 4 seconds?

15) The position of a weight attached to a spring is $s(t) = -2 \cos (7\pi t)$ inches after $t$ seconds. What is the maximum height that the weight rises above the equilibrium position?

16) The position of a weight attached to a spring is $s(t) = -3 \cos 7t$ inches after $t$ seconds. What are the frequency and period of the system?

17) The position of a weight attached to a spring is $s(t) = -2 \cos 5\pi t$ inches after $t$ seconds. When does the weight first reach its maximum height?

18) A weight attached to a spring is pulled down 4 inches below the equilibrium position. Assuming that the frequency of the system is $\frac{3}{\pi}$ cycles per second, determine a trigonometric model that gives the position of the weight at time $t$ seconds.

19) The position of a weight attached to a spring is $s(t) = -6 \cos 20\pi t$ inches after $t$ seconds. What is the maximum height that the weight reaches above the equilibrium position and when does it first reach the maximum height? Round values to two decimal places, if necessary.

20) A guitar string is plucked so that it vibrates with a frequency of $F = 65$. Suppose the maximum displacement at the center of the string is $s(0) = 0.54$. Find an equation of the form $s(t) = a \cos bt$ to model this displacement. Round constants to 2 decimal places.
Answer Key
Testname: 1720CH4REVIEW

1) 1C, 2A, 3B, 4D
2) 1B, 2D, 3C, 4A
3) 1B, 2D, 3C, 4A
4) 4
5) 3
6) $\frac{2\pi}{5}$
7) $8\pi$
8) $y = 3 \sin \left( \frac{1}{2}x \right)$
9) $y = 5 \cos \left( \frac{1}{3}x \right)$
10) $y = -3 \cos (2x)$
11) 30
12) March; $10,700$
13) $s(t) = 8 \sin 6t$
14) $\frac{12}{\pi^2}$
15) 2 in.
16) Frequency $= \frac{7}{2\pi}$ cycles per sec, period $= \frac{2\pi}{7}$ sec
17) After $\frac{1}{5}$ sec
18) $s(t) = -4 \cos 6t$
19) The maximum height of 6 inches is first reached after 0.05 seconds.
20) $s(t) = 0.54 \cos 408.41t$