Name: _____ Date: _____

BLM 5–8

Chapter 5 Test

Multiple Choice

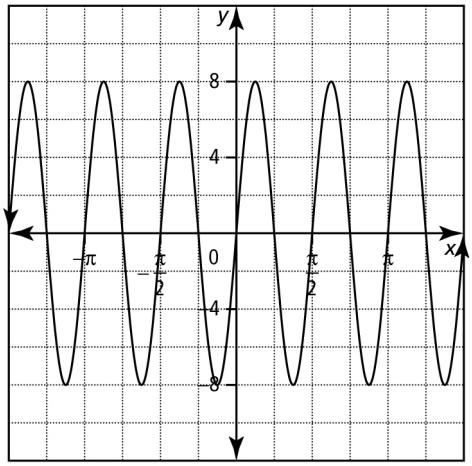
For #1 to #4, select the best answer.

1. The minimum value of the function $f(\theta) = a \cos b(\theta - c) + d$, where $a > 0$, can be expressed as

A $a - d$ **B** $a - d - c$

C $d - |a|$ **D** $\frac{d-a}{b}$

2. Which of the following is the equation of the sine wave graphed below?



A $y = 8 \sin\left(\frac{1}{4}x\right)$ **B** $y = 8 \sin\left(\frac{1}{2}x\right)$

C $y = 8 \sin(2x)$ **D** $y = 8 \sin(4x)$

3. When the graph of $y = \sin\theta$ has been transformed according to the directions $y = \sin\left(\frac{1}{6}x + \frac{\pi}{2}\right)$, the horizontal phase shift of the resultant graph is

A $\frac{\pi}{12}$ units to the right

B $\frac{\pi}{2}$ units to the left

C $\frac{\pi}{2}$ units to the right

D 3π units to the left

4. Colin is investigating the effect of changing the values of the parameters a, b, c, and d in the equation $y = a \sin b(\theta - c) + d$. He graphed the function $f(x) = \sin\theta$. He then determined that the transformation that does not change the x-intercepts is described by

A $g(\theta) = 2 \sin\theta$

B $h(\theta) = \sin 2\theta$

C $r(\theta) = \sin(\theta + 2)$

D $s(\theta) = \sin\theta + 2$

Short Answer

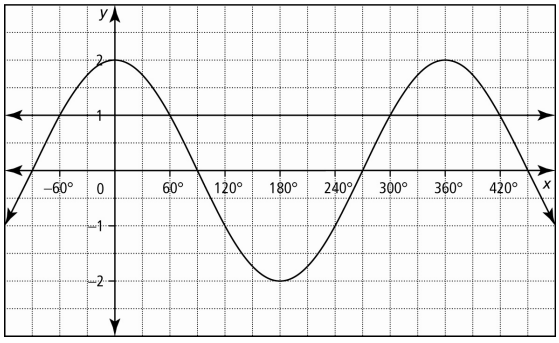
5. The pedals on a bicycle have a maximum height of 30 cm above the ground and a minimum height of 8 cm above the ground. Out for a ride, a cyclist pedals at a constant rate of 20 cycles per minute. Write an equation for this periodic function in the form $y = a \sin(bt) + d$.

6. Write the equation of a cosine function in the form $y = a \cos b(x - c) + d$, with an amplitude of 2, period of 6π, phase shift of π units to the left, and translated 3 units down.

7. State the amplitude and range for the graph of $y = -5 \sin\theta - 3$.

8. a) What system of equations can be solved using the graph below?

b) State one single equation that can be solved using the graph. Then, give the general solution to the equation.



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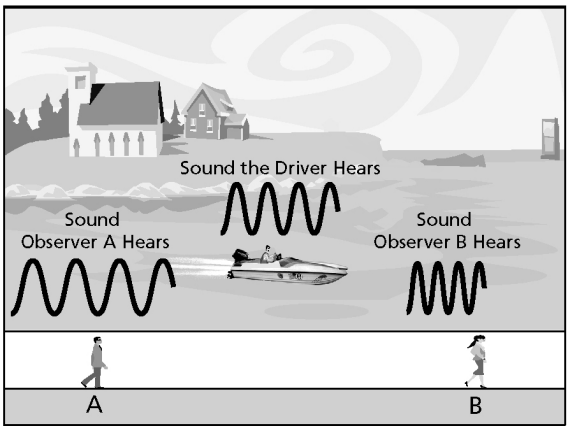
(continued)

9. Consider the graph of $y = \tan \theta$, where θ is measured in radians.

a) What is the general equation of the asymptotes of the graph?

b) What are the domain and range of the graph of the function?

10. A boat is travelling along a narrow river between two observers, as shown. The driver and both observers can hear the boat's motor, but the sound that each of them hears is different, depending on their location in relation to the boat. The observer in front of the boat hears a higher-pitched noise than the driver hears. The observer behind the boat hears a lower-pitched sound than the driver hears.



a) Suppose the sound of the boat is modelled by a sinusoidal function. Which characteristic—amplitude, period, or range—varies among the three sound waves?

b) Which parameter in the equation $y = a \sin bt + d$ would change if all three functions were graphed?

c) Which observer's model equation would have the largest value of the changing parameter?

Extended Response

11. You are sitting on a pier when you notice a bottle bobbing in the waves. The bottle reaches 0.8 m below the pier, before lowering to 1.4 m below the pier. The bottle reaches its highest point every 5 s.

a) Sketch and label a graph of the bottle's distance below the pier for 15 s. Assume that at $t = 0$, the bottle is closest to the bottom of the pier.

b) Determine the period and the amplitude of the function.

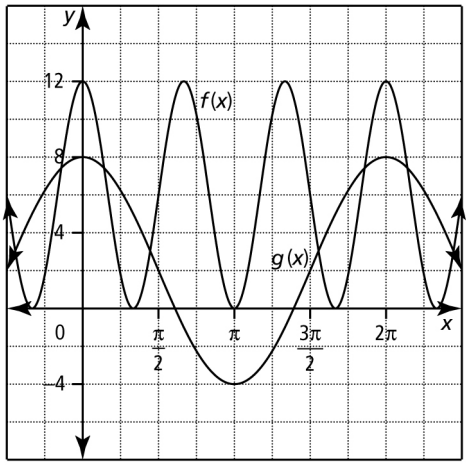
c) Which function would you consider to be a better model of the situation, sine or cosine? Explain.

d) Write the equation of the sine function that models the bottle's distance below the pier.

e) You can reach 0.9 m below the pier. Use your equation to estimate the length of time, to the nearest tenth of a second, that the bottle is within your reach during one cycle.

f) Write the cosine function for this situation. Would your answer for part e) change using this equation? Explain.

12. Two sinusoidal functions are shown in the graph.



a) Which characteristics of the two graphs are the same?

b) Which parameters must change to transform the graph of $f(x)$ to the graph of $g(x)$?

c) Determine the equation for each of the graphs in the form $y = a \cos b(x - c) + d$.