A∞Ω
MATH@TD
MCR3U

Name _____

11U6: Sinusoidal Functions - Test W24

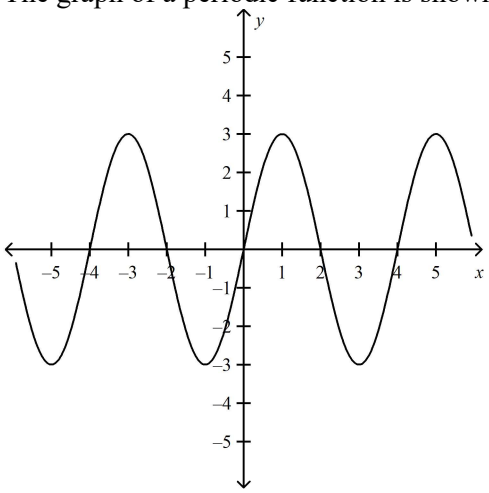
K ____/7 T ____/8 C ____/7 A ____/7

Multiple Choice **K ____/5**

Identify the choice that best completes the statement or answers the question.

1. A spring bounces up and down according to the model $d(t) = 4\sin(30t) + 3$, where $d(t)$ is the displacement in cm from the rest position and t is time in seconds. What is the equation of the central axis?
   a. $y = 2$ c. $y = 4$
   b. $y = 3$ d. $y = 5$

2. The graph of a periodic function is shown below. What is the period of the function?



   a. 2 c. 4
   b. 3 d. 6

3. Which of the following situations would produce a periodic graph?
   a. the height of a point on the edge of a wheel for a person riding a bike at a constant rate
   b. the height of a person who is jumping on a trampoline
   c. the height of a person riding a stationary bike at a constant rate for 5 minutes
   d. the height of a plane that is in its decent for landing

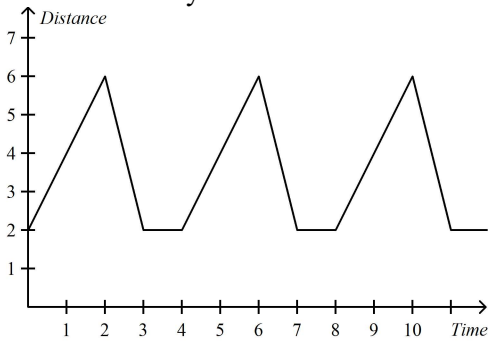
4. Determine the amplitude of the function $y = -4\sin x - 7$.
   a. 7 c. 4
   b. –7 d. –4

5. Frank is riding a Ferris wheel, where t is time in seconds. Suppose the Ferris wheel is 20 m tall. Let $h(t) = 10\cos(12t)$ represent the height of Frank in m above or below the centre of the Ferris wheel. How long does it take to make two complete cycles on the Ferris wheel? Assume there are no stops.
   a. 60 s c. 45 s
   b. 30 s d. 120 s

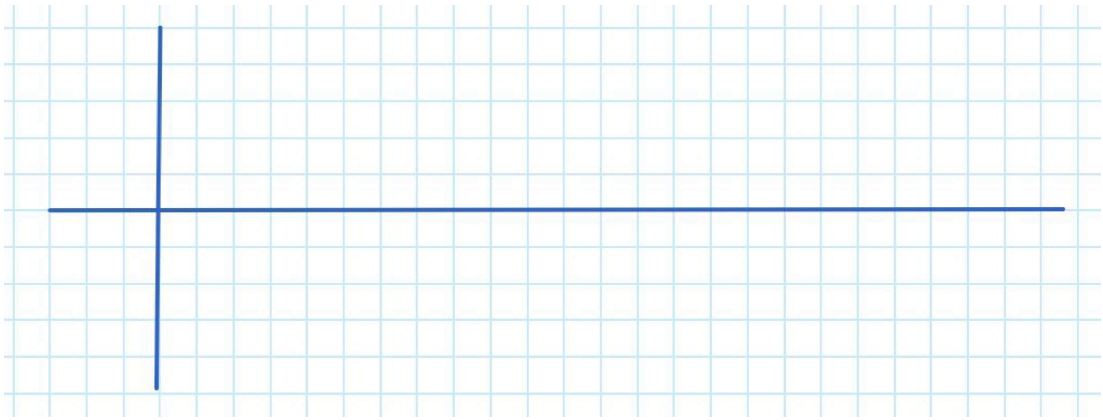
Full Solution

Provide clear solutions to the following problems. Upto 2 Communications points are awarded for clarity in your presentation of the mathematics invovled in your solution.

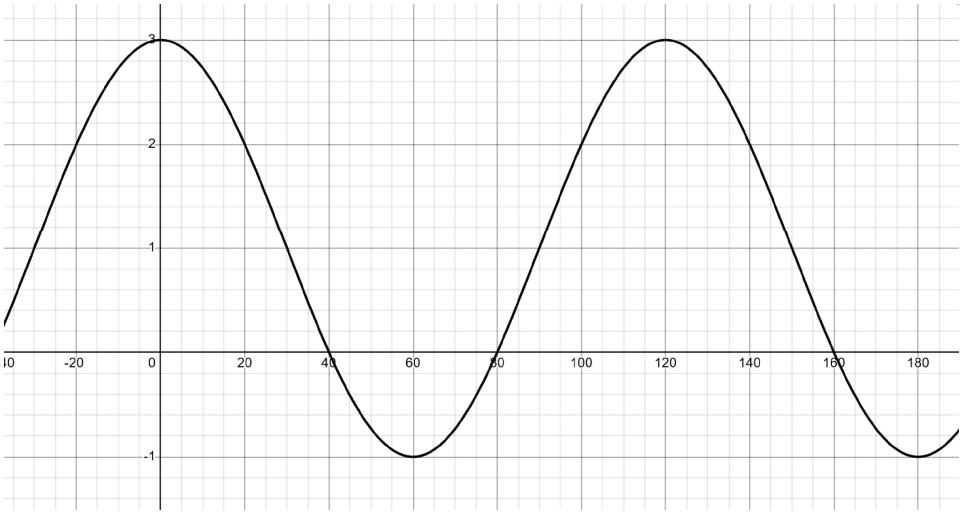
6. Describe a scenario that could produce the following periodic sketch. Distance is in metres and time in seconds. Feel free to be funny. **C ____/2**



7. Sketch two full cycles of the function $f(x) = 2\sin(3x - 90) - 1$. **A ____/3, C ____/1**



8. Determine both a sine and a cosine function which represents the given sketch. **A ____/4**



9. Determine the range of the function $K(t) = 6\cos(90t) - 10$. **T ____/2**

10. For the following table of data, determine an equation of a cosine function that satisfies the given data. **T ____/2**

x	−60°	−30°	0°	30°	60°	90°	120°
y	10	8	6	8	10	8	6

11. A buoy rises and falls as it rides the waves. The equation $h(t) = 1.5\sin(36t)$ models the displacement of the buoy, $h(t)$, in metres at t seconds. That displacement is the distance above or below the level of "still water" the bouy is when riding the the waves.

a) Determine the amplitude of the function. What does the amplitude represent in this scenario?

K ____/1 C ____/1

b) Determine the period of the function. What does the period represent in this scenario? **K ____/1 C ____/1**

Bonus (0.5 each)

c) What is the displacement at 14 s?

d) At what time, to the nearest tenth of a second, does the displacement first reach 0.7 m.

12. A certain town has a windmill whose blades reach 20 m high. One tip of one of the blades is painted red. Over a period of 30 seconds, that red tip moves from 20 m from the ground (highest point) down to 2 m from the ground and back up to 20 m away as the blades turn.

a) What is the equation of the central axis? **T ____/1**

b) What is the length of a windmill blade? **T ____/1**

c) Determine a sinusoidal equation which models the rotation of the red tipped blade. **T ____/2**