

Name \_\_\_\_\_

## MRS21-ADDITIONAL LESSON-1

1.

The Ferris wheel at the landmark Navy Pier in Chicago takes 7 minutes to make one full rotation. The height,  $H$ , in feet, above the ground of one of the six-person cars can be modeled by

$$H(t) = 70 \sin\left(\frac{2\pi}{7}(t - 1.75)\right) + 80, \text{ where } t \text{ is time, in}$$

minutes. Using  $H(t)$  for one full rotation, this car's minimum height, in feet, is

- (1) 150                                      (3) 10  
(2) 70                                        (4) 0

2.

A circle centered at the origin has a radius of 10 units. The terminal side of an angle,  $\theta$ , intercepts the circle in quadrant II at point  $C$ . The  $y$ -coordinate of point  $C$  is 8. What is the value of  $\cos \theta$ ?

- (1)  $-\frac{3}{5}$                                       (3)  $\frac{3}{5}$   
(2)  $-\frac{3}{4}$                                       (4)  $\frac{4}{5}$

3.

The voltage used by most households can be modeled by a sine function. The maximum voltage is 120 volts, and there are 60 cycles *every second*. Which equation best represents the value of the voltage as it flows through the electric wires, where  $t$  is time in seconds?

- (1)  $V = 120 \sin(t)$                       (3)  $V = 120 \sin(60\pi t)$   
(2)  $V = 120 \sin(60t)$                 (4)  $V = 120 \sin(120\pi t)$

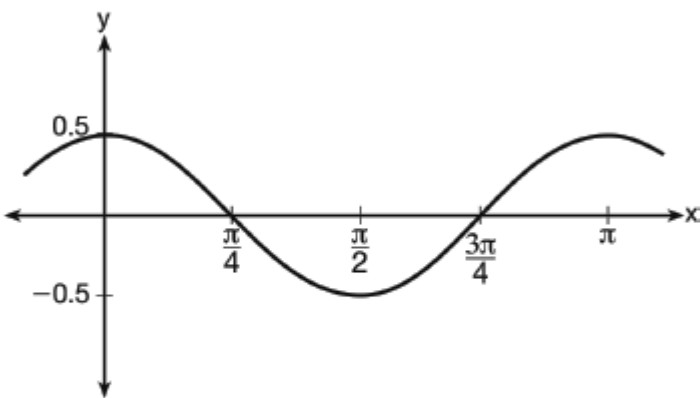
4.

Given the parent function  $p(x) = \cos x$ , which phrase best describes the transformation used to obtain the graph of  $g(x) = \cos(x + a) - b$ , if  $a$  and  $b$  are positive constants?

- (1) right  $a$  units, up  $b$  units  
(2) right  $a$  units, down  $b$  units  
(3) left  $a$  units, up  $b$  units  
(4) left  $a$  units, down  $b$  units

5.

Which equation is represented by the graph shown below?



(1)  $y = \frac{1}{2} \cos 2x$

(3)  $y = \frac{1}{2} \cos x$

(2)  $y = \cos x$

(4)  $y = 2 \cos \frac{1}{2}x$

6.

Given that  $\sin^2 \theta + \cos^2 \theta = 1$  and  $\sin \theta = -\frac{\sqrt{2}}{5}$ , what is a possible value of  $\cos \theta$ ?

(1)  $\frac{5 + \sqrt{2}}{5}$

(3)  $\frac{3\sqrt{3}}{5}$

(2)  $\frac{\sqrt{23}}{5}$

(4)  $\frac{\sqrt{35}}{5}$

7.

Based on climate data that have been collected in Bar Harbor, Maine, the average monthly temperature, in degrees F, can be modeled by the equation  $B(x) = 23.914\sin(0.508x - 2.116) + 55.300$ . The same governmental agency collected average monthly temperature data for Phoenix, Arizona, and found the temperatures could be modeled by the equation  $P(x) = 20.238\sin(0.525x - 2.148) + 86.729$ .

Which statement can *not* be concluded based on the average monthly temperature models  $x$  months after starting data collection?

- (1) The average monthly temperature variation is more in Bar Harbor than in Phoenix.
- (2) The midline average monthly temperature for Bar Harbor is lower than the midline temperature for Phoenix.
- (3) The maximum average monthly temperature for Bar Harbor is  $79^{\circ}\text{F}$ , to the nearest degree.
- (4) The minimum average monthly temperature for Phoenix is  $20^{\circ}\text{F}$ , to the nearest degree.

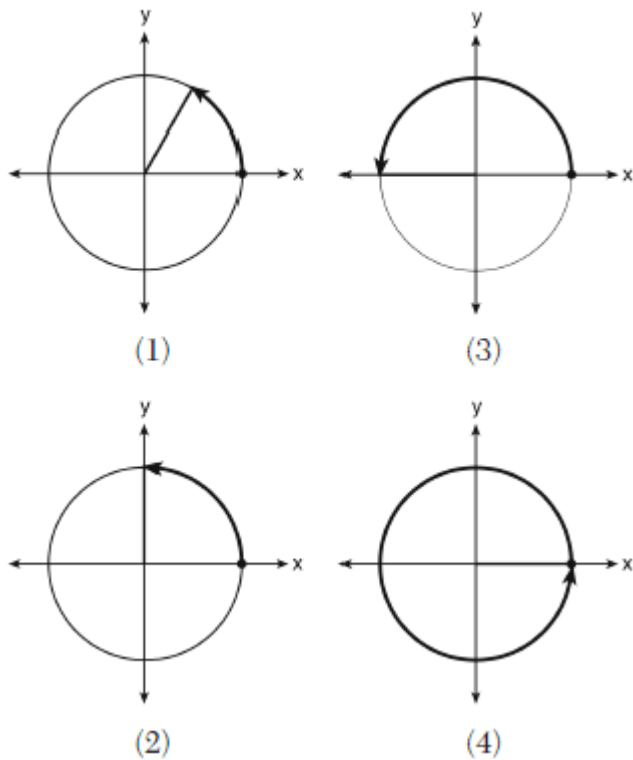
8.

A sine function increasing through the origin can be used to model light waves. Violet light has a wavelength of 400 nanometers. Over which interval is the height of the wave *decreasing*, only?

- |                |                |
|----------------|----------------|
| (1) (0, 200)   | (3) (200, 400) |
| (2) (100, 300) | (4) (300, 400) |

9.

Which diagram shows an angle rotation of 1 radian on the unit circle?



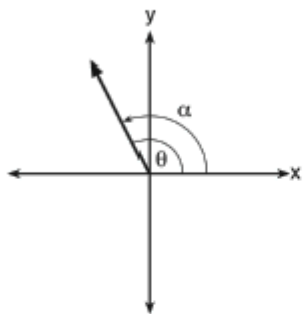
10.

As  $x$  increases from 0 to  $\frac{\pi}{2}$ , the graph of the equation  $y = 2 \tan x$  will

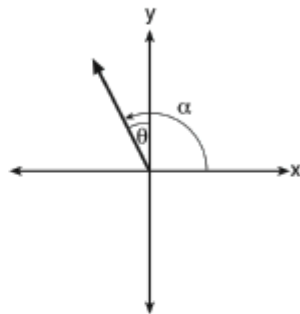
- (1) increase from 0 to 2
- (2) decrease from 0 to  $-2$
- (3) increase without limit
- (4) decrease without limit

11.

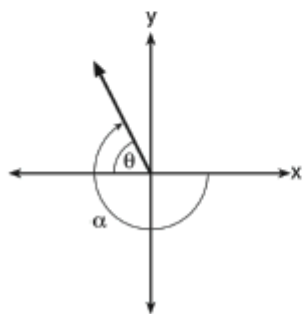
Which diagram represents an angle,  $\alpha$ , measuring  $\frac{13\pi}{20}$  radians drawn in standard position, and its reference angle,  $\theta$ ?



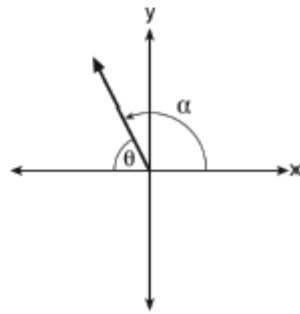
(1)



(3)



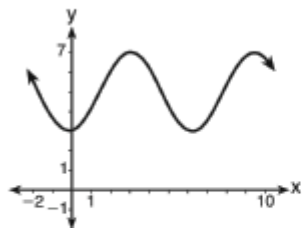
(2)



(4)

12.

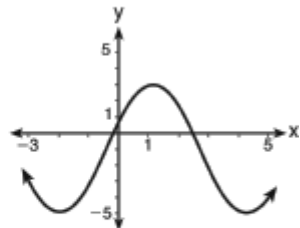
Which sinusoid has the greatest amplitude?



(1)

$$y = 3 \sin(\theta - 3) + 5$$

(2)



(3)

$$y = -5 \sin(\theta - 1) - 3$$

(4)