

Date: _____

1.

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

3.

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) $\frac{5 + \sqrt{2}}{5}$
- (2) $\frac{\sqrt{23}}{5}$
- (3) $\frac{3\sqrt{3}}{5}$
- (4) $\frac{\sqrt{35}}{5}$

5.

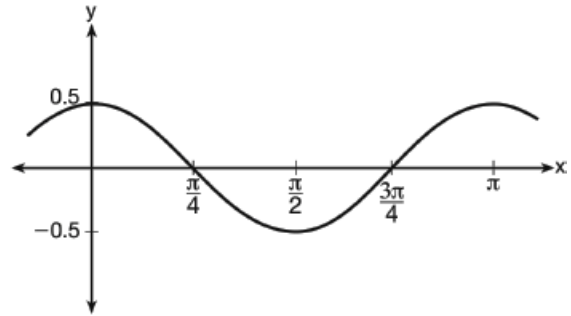
Based on climate data that have been collected in Bar Harbor, Maine, the average monthly temperature, in degrees F, can be modeled by the equation $B(x) = 23.914\sin(0.508x - 2.116) + 55.300$. The same governmental agency collected average monthly temperature data for Phoenix, Arizona, and found the 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°F , to the nearest degree.
- (4) The minimum average monthly temperature for Phoenix is 20°F , to the nearest degree.

2.

Which equation is represented by the graph shown below?



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

4.

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

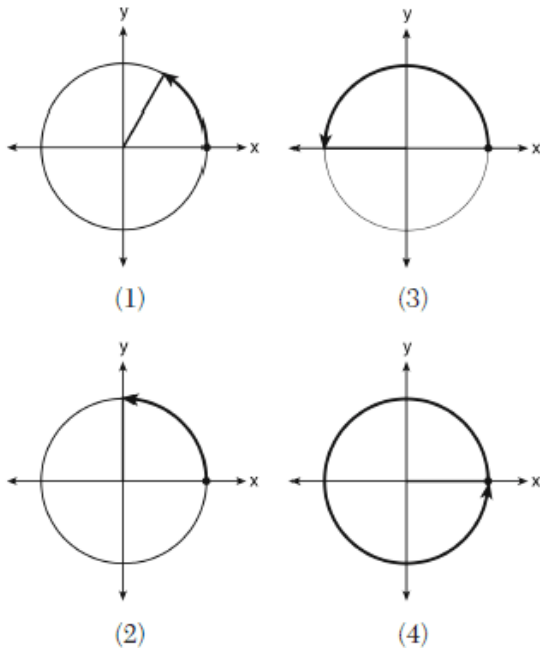
6.

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)
- (2) (100, 300)
- (3) (200, 400)
- (4) (300, 400)

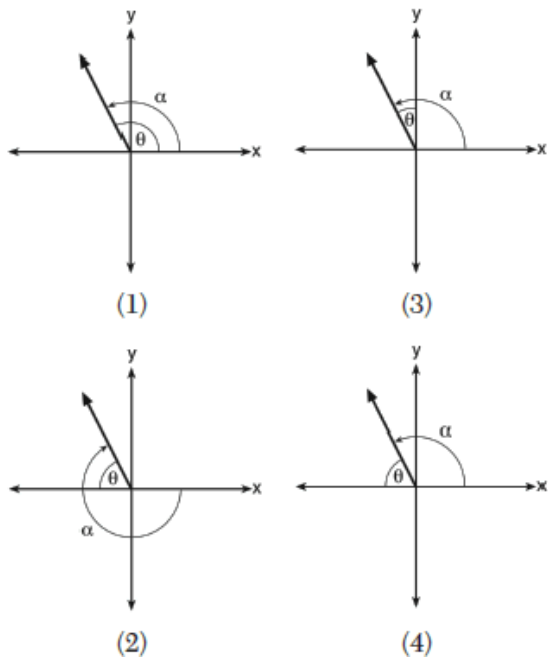
7.

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



9.

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



11.

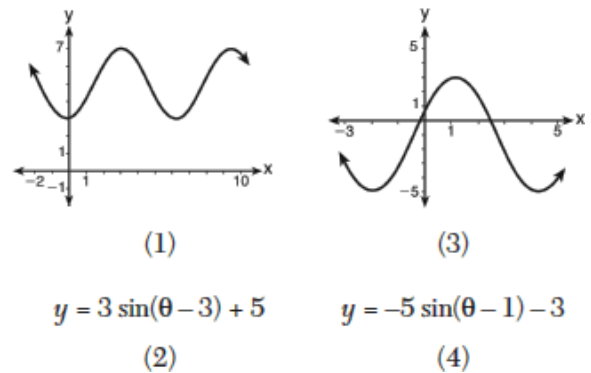
8.

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

10.

Which sinusoid has the greatest amplitude?



12.

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 |

A circle centered at the origin has a radius of 10 units. The terminal side of an angle, θ , 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) $\frac{4}{5}$ |