

1) If the angle of elevation from a point 12 feet from the base of a building to the top of the building is θ and if $\sec \theta = \frac{5}{4}$, then the height of the building is

- A) 9 feet
- B) 16 feet
- C) $\frac{36}{5}$ feet
- D) 8 feet
- E) $\frac{48}{5}$ feet

2) The exact value of $\sin(-210^\circ) + \cot(735^\circ) + \tan(285^\circ)$ is

- A) $\frac{1}{2}$
- B) $\frac{\sqrt{2}}{2}$
- C) $-\frac{\sqrt{3}}{2}$
- D) $-\frac{1}{2}$
- E) $\frac{\sqrt{3}}{2}$

3) If $\tan \theta = \frac{3}{4}$, where θ is in the third quadrant, then $\csc \theta =$

A) $-\frac{5}{3}$

B) $\frac{5}{3}$

C) $-\frac{13}{5}$

D) $-\frac{5}{4}$

E) $\frac{5}{4}$

4) The range of the function $f(x) = 3 - |\cos(x - \pi)|$ is

A) $[2, 3]$

B) $[2, 4]$

C) $[-3, 3]$

D) $(2, 4)$

E) $(2, 3)$

5) The graph of the function $f(x) = \csc\left(\frac{\pi x}{2}\right)$, $-2 < x < 2$, intersects the line $y = -2$ at

- A) 2 points
- B) 5 points
- C) 1 point
- D) 4 points
- E) 3 points

6) The number of the x -intercepts of the graph of $f(x) = 2 \tan\left(3x - \frac{\pi}{4}\right)$, where $-\frac{\pi}{4} \leq x \leq \frac{3\pi}{4}$, is

- A) 4
- B) 3
- C) 1
- D) 5
- E) 2

7) If P is the period of the graph of $f(x) = 5 \sec 2\left(x - \frac{\pi}{4}\right)$ and A is the amplitude of $y = -\pi \sin\left(\frac{x}{3}\right)$, then $A + P =$

A) 2π

B) 0

C) 4π

D) π

E) 3π

8) If the domain of $f(x) = \pi + 5 \cos^{-1}\left(\frac{x}{2} + b\right)$ is $[3, 7]$, then $2b + 1 =$

A) -4

B) -5

C) 4

D) 5

E) 6

9) The exact value of $\cos^{-1} \left[\cos \left(\frac{5\pi}{4} \right) \right]$ is

A) $\frac{3\pi}{4}$

B) $\frac{\pi}{4}$

C) $\frac{5\pi}{4}$

D) $-\frac{\pi}{4}$

E) undefined

10) Which one of the following statements is FALSE ?

A) If $0 \leq \theta < \frac{\pi}{2}$ and $\tan \theta = \frac{1}{2}$, then $\sin \theta = 1$ and $\cos \theta = 2$

B) If $0 \leq \theta < \frac{\pi}{2}$, then $\sec^2 \theta - \tan^2 \theta = 1$

C) If $0 \leq \theta < \frac{\pi}{2}$, then $\sin \left(\frac{\theta}{2} \right)$ is positive

D) The range of $\tan \theta$ is $(-\infty, \infty)$

E) $\sin \left(-\frac{\pi}{3} \right) = \sin \left(\frac{5\pi}{3} \right)$

11) $\cos^{-1}\left(-\frac{1}{2}\right) - \tan^{-1}\left(\frac{\sqrt{3}}{3}\right) =$

A) $\frac{\pi}{2}$

B) $\frac{3\pi}{2}$

C) $\frac{\pi}{3}$

D) $\frac{5\pi}{6}$

E) $\frac{7\pi}{4}$

12) $\tan\left[\sin^{-1}\left(-\frac{5}{13}\right)\right] =$

A) $-\frac{5}{12}$

B) $-\frac{4}{5}$

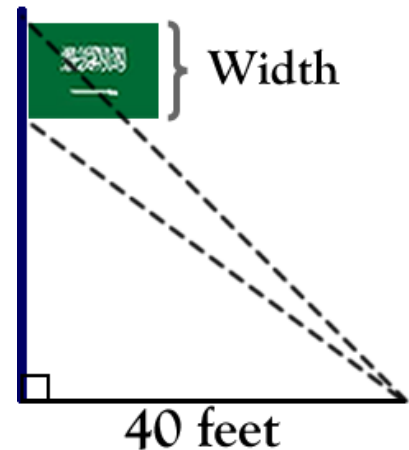
C) $\frac{12}{5}$

D) $-\frac{12}{5}$

E) $\frac{5}{12}$

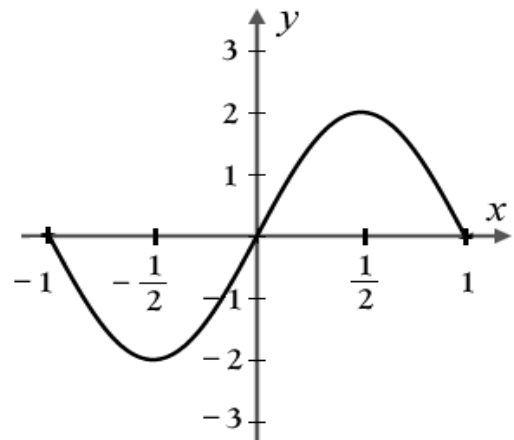
- 13) Measurements taken 40 feet from the base of a flagpole show the angle of elevation to the top of the flagpole to be 60° and the angle of elevation to the bottom of the flag to be 45° . Determine the vertical width of the flag.

- A) $40(\sqrt{3} - 1)$ feet
B) $6\sqrt{3}$ feet
C) $\frac{20\sqrt{3}}{3}$ feet
D) 12 feet
E) $\frac{40\sqrt{3}}{3}$ feet



- 14) If the adjacent figure represents the graph of $y = -2\cos(bx + c)$, then

- A) $b = \pi$ and $c = \frac{\pi}{2}$
B) $b = \pi$ and $c = -\frac{\pi}{2}$
C) $b = 2\pi$ and $c = -\frac{\pi}{4}$
D) $b = 2\pi$ and $c = \frac{\pi}{4}$
E) $b = \pi$ and $c = \frac{\pi}{4}$



15) The exact value of $12 \csc\left(\frac{35\pi}{3}\right) + \tan\left(-\frac{2\pi}{3}\right)$ is equal to

A) $-7\sqrt{3}$

B) $\frac{10\sqrt{3}}{3}$

C) $-3\sqrt{3}$

D) $4\sqrt{3}$

E) $-5\sqrt{3}$

16) The reference angle of $\theta = \frac{11\pi}{15}$, in degrees, is equal to

A) 48°

B) 32°

C) 49°

D) 38°

E) 35°

17) If $f(x) = a \tan(bx)$, $b > 0$, is a tangent function with period 3 and

$$f(1) = 2\sqrt{3}, \text{ then } f\left(\frac{3}{4}\right) =$$

A) 2

B) $\sqrt{3}$

C) 1

D) $\frac{2\sqrt{3}}{3}$

E) $\frac{\sqrt{3}}{3}$

18) If R is the reference angle of 1945° and Q is the smallest positive coterminal angle of -950° , then $R + Q$

A) 165°

B) 155°

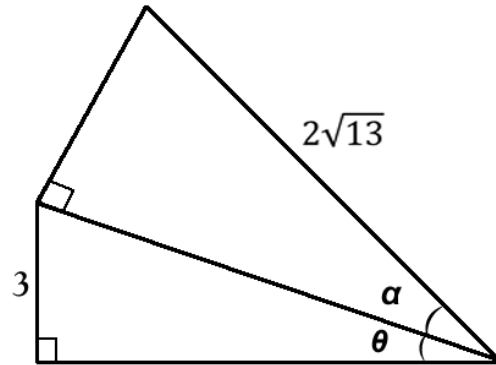
C) 175°

D) 275°

E) 255°

19) In the following figure, if $\tan \alpha = \frac{2}{3}$, then $\theta =$

- A) 30°
- B) 45°
- C) 15°
- D) 75°
- E) 60°



20) The smallest positive coterminal angle of $\theta = \frac{23\pi}{7}$ is

- A) in the third quadrant
- B) in the first quadrant
- C) in the fourth quadrant
- D) a quadrantal angle
- E) in the second quadrant