1. Find r if $AB = 16$ and $AD = 24$.

   a) $r = 6$

   b) $r = 5$

   c) $r = 13$

   d) $r = 10$

   e) $r = 11$

2. Indicate the quadrants in which the terminal side of θ must lie in order that $\sin\theta$ is negative and $\tan\theta$ is negative.

   a) IV

   b) III

   c) I

   d) II

   e) None of the above

3. Find $\sec\theta$ if $\tan\theta = \frac{3}{4}$ and θ terminates in quadrant III.

   a) $\sec\theta = -\frac{4}{3}$

   b) $\sec\theta = -\frac{5}{4}$

   c) $\sec\theta = \frac{5}{4}$

   d) $\sec\theta = \frac{4}{3}$

   e) $\sec\theta = -\frac{4}{5}$

4. Find an expression that is equal to $(\sin\theta - \cos\theta)^2 - 1$.

   a) $-2\sin\theta\cos\theta$

   b) $\sin^2\theta$

   c) $2\sin\theta\cos\theta$

   d) $-\sin^2\theta$

   e) $\cot^2\theta$

5. Find the exact value of $\sec 45°$.

   a) $\sqrt{2}$

   b) $-5\sqrt{2}$

   c) $5\sqrt{2}$

   d) $-\sqrt{2}$

   e) 0

6. The figure shows two right triangles drawn at 90° to each other. If $\angle ABD = 60°, C = 45°$, and $BC = 43$, find h.

   a) $43\sqrt{3}$

   b) $\frac{43}{2}$

   c) $\frac{43}{\sqrt{3}}$

   d) 86

   e) 34

7. A 74-foot rope from the top of a circus tent pole is anchored to the ground 37 feet from the bottom of the pole. What angle does the rope make with the pole? (Assume the pole is perpendicular to the ground.)

   a) $\cos^{-1}(2)$

   b) $\tan^{-1}\left(\frac{1}{2}\right)$

   c) $\sin^{-1}\left(\frac{1}{2}\right)$

   d) $\tan^{-1}(2)$

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

8. Find the exact value of $\cos(-45°)$.

   a) $\frac{\sqrt{2}}{2}$

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

   c) $-\frac{\sqrt{2}}{2}$

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

   e) $-\frac{\sqrt{3}}{2}$

9. Give the exact value of $6\cos\left(-\frac{3\pi}{4}\right)$.

   a) $3\sqrt{2}$

   b) $2\sqrt{2}$

   c) $-3\sqrt{3}$

   d) $-2\sqrt{2}$

   e) $-3\sqrt{2}$

10. Solve $\sin t = -\cos t$ for $0^\circ \le t \le 360^\circ$.

a) $135^\circ, 315^\circ$

b) $140^\circ, 310^\circ$

c) $145^\circ, 305^\circ$

d) $135^\circ, 310^\circ$

e) $140^\circ, 315^\circ$

11. An arc of length 3 feet is cut off by a central angle of $\frac{\pi}{3}$ radians. Find the area of the sector formed.

a) $\frac{27}{2\pi}$ ft^2

b) 54π ft^2

c) $\frac{3}{2\pi}$ ft^2

d) 9π ft^2

e) 3π ft^2

12. Find the angular velocity associated with $33\frac{1}{3}$ rpm.

a) 200π

b) 100π

c) 100

d) $\frac{100\pi}{3}$

e) $\frac{200\pi}{3}$

13. Give the amplitude and period of the given graph.

a) Amplitude = 6, period = π

b) Amplitude = 5, period = 3π

c) Amplitude = 6, period = $\frac{5\pi}{2}$

d) Amplitude = 6, period = 3π

e) Amplitude = 5, period = π

14. Identify the amplitude and phase shift for the equation $y = 2\cos\left(2x + \frac{\pi}{2}\right)$.

a) Amplitude = 3 and phase shift = $-\frac{\pi}{4}$

b) Amplitude = 2 and phase shift = $-\frac{\pi}{4}$

c) Amplitude = 2 and phase shift = $\frac{\pi}{4}$

d) Amplitude = 3 and phase shift = $-\frac{\pi}{4}$

e) Amplitude = 2 and phase shift = $\frac{\pi}{2}$

15. The graph below is one complete cycle of the graph of an equation containing a trigonometric function. Find an equation to match the graph.

a) $y = -8\sin\left(3x - \frac{\pi}{2}\right)$

b) $y = 6\sin\left(3x - \frac{\pi}{2}\right)$

c) $y = 4\sin\left(3x - \frac{\pi}{2}\right)$

d) $y = 3\sin\left(3x\frac{\pi}{2}\right)$

e) $y = 7\sin\left(3x - \frac{\pi}{2}\right)$

16. Evaluate $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$.

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

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

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

d) $\frac{\pi}{6}$

e) 0

17. Find an identical expression for $\frac{\sin x}{1+\cos x} + \frac{1+\cos x}{\sin x}$.

a) $2\csc x$

b) $2\csc^2 x$

c) $2\sec^2 x$

d) $2\sec x$

e) $\sin x$

18. Let $\sin A = \frac{3}{5}$ with A in quadrant II and $\sin B = -\frac{5}{13}$ with B in quadrant III. Find $\sin(A + B)$.

a) $-\frac{3}{13}$

b) $\frac{14}{65}$

c) $-\frac{16}{65}$

d) $-\frac{9}{13}$

e) $\frac{16}{65}$

19. Find the expression equivalent to $\sin 150^\circ$.

a) $2\cos^2 75^\circ - \sin^2 75^\circ$

b) $\cos^2 75^\circ + \sin^2 75^\circ$

c) $\sin 75^\circ \cos 75^\circ$

d) $2\sin 75^\circ \cos 75^\circ$

e) $2\sin 299^\circ \cos 300^\circ$

20. If $\sin A = -\frac{3}{5}$ with A in quadrant IV, find $\cos \frac{A}{2}$.

a) $-\frac{3}{\sqrt{10}}$

b) $\frac{1}{\sqrt{7}}$

c) $-\frac{7}{\sqrt{10}}$

d) $-\frac{1}{\sqrt{4}}$

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

21. Simplify $\sin \frac{7\pi}{12} - \sin \frac{\pi}{12}$.

a) $-\frac{\sqrt{2}}{2}$

b) $\frac{\sqrt{2}}{2}$

c) $\sqrt{12}$

d) $2\sqrt{2}$

e) $\frac{1}{2\sqrt{2}}$

22. Solve $2\sin^2\theta - 9\sin\theta = 5$ for $0 \le \theta < 360^\circ$.

a) $120^\circ, 240^\circ$

b) $210^\circ, 330^\circ$

c) $240^\circ, 300^\circ$

d) $60^\circ, 300^\circ$

e) $30^\circ, 150^\circ$

23. Solve the equation $\sin x + \cos 2x = 0$ for x if $0 \le x < 2\pi$.

a) $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$

b) $0, \frac{\pi}{3}, \frac{5\pi}{3}$

c) $\frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$

d) $0, \frac{2\pi}{3}, \frac{4\pi}{3}$

e) $\frac{\pi}{3}, \pi, \frac{5\pi}{3}$

24. Find the smallest positive value of t for which $\cos 2\pi t = \frac{1}{2}$.

a) $t = \frac{1}{6}$

b) $t = \frac{1}{2}$

c) $t = \frac{1}{4}$

d) $t = \frac{1}{8}$

e) $t = \frac{1}{5}$

25. A man standing near a radio station antenna observes that the angle of elevation to the top of the antenna is 60°. He then walks 100 feet further away and observes that the angle of elevation to the top of the antenna is 45°. Find the height of the antenna.

a) $100\sqrt{3}$ ft

b) $\frac{100\sqrt{3}}{(\sqrt{3}-1)}$ ft

c) $\frac{100}{\sqrt{3}}$ ft

d) 200 ft

e) $200\sqrt{3}$ ft

26. Use the law of cosines to find a true statement from the list below, if $C = 90^\circ$.

a) $c^2 = a^2 + b^2 - ab\sqrt{2}$

b) $c^2 = a^2 + b^2 + ab\sqrt{2}$

c) $c^2 = a^2 + b^2$

d) $c^2 = a^2 + b^2 + ab$

e) $c^2 = a^2 + b^2 - ab$

27. Referring to triangle ABC, find the triangle's area given that $a = 3$ inches, $b = 4$ inches and $c = 5$ inches.

a) 10 inches^2

b) 60 inches^2

c) 30 inches^2

d) 5 inches^2

e) 6 inches^2

28. Convert $(4, -4\sqrt{3})$ to polar coordinates with $r \geq 0$ and θ between 0° and 360°.

a) $(8, 320^\circ)$

b) $(5, 315^\circ)$

c) $(7, 305^\circ)$

d) $(6, 290^\circ)$

e) $(8, 300^\circ)$

29. Write the equation $x^2 + y^2 = 5$ in polar coordinates.

a) $r^2 = 2$

b) $r^2 = 5$

c) $r^2 = 5^2$

d) $r^2 = \sqrt{5}$

e) $r^2 = 7$

30. Identify the graph of $r = 2\cos 3\theta$.