1 Use algebra to find all solutions to the equation in the interval $[0, 2\pi)$.

$2\sin^2 z + 3\cos z = 0$

2 Find the vertex and directrix of the parabola. $x^2 - 8x - 36y - 164 = 0$

a. vertex is $(5, -4)$
directrix is $y = -14$

b. vertex is $(-4, 5)$
directrix is $y = -14$

c. vertex is $(-5, 4)$
directrix is $y = 14$

d. vertex is $(4, -5)$
directrix is $y = 14$

e. vertex is $(4, -5)$
directrix is $y = -14$

f. vertex is $(-4, 5)$
directrix is $y = 14$

3 Find a polynomial function f of degree 3 such that $f(10) = 13$ and the roots of $f(x)$ are 0, 7, and 9.

a. $f(x) = \frac{30}{13}x(x + 7)(x + 9)$

b. $f(x) = \frac{30}{13}x(x - 7)(x - 9)$

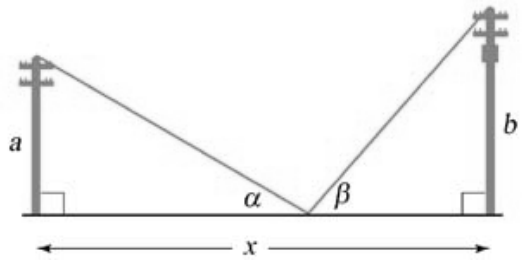
c. $f(x) = 13(x + 7)(x + 9)$

d. $f(x) = \frac{13}{30}x(x - 7)(x - 9)$

e. $f(x) = \frac{13}{30}x(x + 7)(x + 9)$

f. $f(x) = 13x(x - 7)(x - 9)$

4 The following figure shows two telephone poles attached by guy wires to a point on the ground between them. Find the distance, x, between the two poles. Let $a = 10$, $b = 30$, $\alpha = 38^\circ$, $\beta = 59^\circ$. Round your answer to the nearest hundredth.



a. 51.24

b. 70.94

c. 80.86

d. 30.83

e. 4.1

f. 28.44

5 Find $\sin(2x)$ given that $x = \arctan\left(-\frac{a}{4}\right)$, where $a > 0$.

a. $\sin(2x) = \dfrac{4}{\sqrt{a^2 + 16}}$

b. $\sin(2x) = \dfrac{-8a}{a^2 + 16}$

c. $\sin(2x) = \dfrac{-8a}{\left(a^2 + 16\right)^2}$

d. $\sin(2x) = \dfrac{-a}{\sqrt{a^2 + 16}}$

e. $\sin(2x) = \dfrac{8a}{a^2 + 16}$

f. $\sin(2x) = \dfrac{-8a}{a^2 - 16}$

6 Functions f and g are defined by $f(x) = \dfrac{x^2 - 25}{x - 5}$ and $g(x) = x + 5$. How do the graphs of f and g differ?

a. The point $(10, 5)$ is not on the graph of $y = f(x)$, but is on the graph of $y = g(x)$.

b. They are the same.

c. The point $(5, 10)$ is not on the graph of $y = f(x)$, but is on the graph of $y = g(x)$.

d. The point $(10, 5)$ is on the graph of $y = f(x)$, but is not on the graph of $y = g(x)$.

e. The point $(5, 10)$ is not on either graph.

f. The point $(5, 10)$ is on the graph of $y = f(x)$, but is not on the graph of $y = g(x)$.

7 The area of a sector of a circle with angle 45° is 18 square feet. Find the radius of the circle.

a. $\dfrac{\sqrt{\pi}}{12}$ ft

b. $\dfrac{12}{\pi}$ ft

c. $\dfrac{144}{\pi}$ ft

d. $\sqrt{\dfrac{72}{\pi}}$ ft

e. $\dfrac{12}{\sqrt{\pi}}$ ft

f. $\sqrt{\dfrac{\pi}{72}}$ ft

8 Give the rule of a periodic function with amplitude: 12, period: 8, and phase shift: - 5 .

a. $f(t) = 12\cos\left(\frac{\pi}{8}t + \frac{5\pi}{4}\right)$

b. $f(t) = -12\cos\left(\frac{\pi}{4}t + \frac{5\pi}{4}\right)$

c. $f(t) = 12\cos\left(\frac{\pi}{4}t + 5\right)$

d. $f(t) = 12\cos\left(\frac{\pi}{4}t - \frac{5\pi}{4}\right)$

e. $f(t) = -12\cos\left(\frac{\pi}{8}t - 5\right)$

f. $f(t) = -12\cos\left(\frac{\pi}{8}t - \frac{5\pi}{4}\right)$

9 Select all points that are at the same location as the polar-coordinate point $\left(3, \frac{\pi}{7}\right)$.

a. $\left(3, -\frac{13\pi}{7}\right)$

b. $\left(-3, \frac{8\pi}{7}\right)$

c. $\left(-3, \frac{13\pi}{7}\right)$

d. $\left(3, \frac{15\pi}{7}\right)$

e. $\left(-3, -\frac{15\pi}{7}\right)$

f. $\left(3, \frac{8\pi}{7}\right)$

g. $\left(3, \frac{13\pi}{7}\right)$

h. $\left(-3, -\frac{6\pi}{7}\right)$

10 Determine the positive radian measure of the angle that the second hand of a clock traces out in the time of 25 seconds.

a. $\frac{11\pi}{6}$

b. $\frac{2\pi}{3}$

c. $\frac{4\pi}{3}$

d. $\frac{7\pi}{6}$

e. $\frac{3\pi}{6}$

f. $\frac{5\pi}{6}$

11 Find an equation for the hyperbola with foci $(\pm c, 0)$, that has asymptotes perpendicular to each other.

a. $y^2 - x^2 = \frac{c^2}{2}$

b. $\frac{y^2}{c^2} - \frac{x^2}{c^2} = 2$

c. $\frac{x^2}{c^2} - \frac{y^2}{c^2} = 2$

d. $x^2 - y^2 = \frac{c^2}{2}$

e. $\frac{x^2}{c^2} - \frac{y^2}{c^2} = 1$

f. $x^2 - y^2 = c$

12 Match each parametric equation in the left column with the corresponding rectangular-coordinate equation in the right column.

$x = 5e^{4t}, y = 9e^{-4t}$	$5x = 9y$
$x = 9\sin t, y = 5\csc t$	$9xy = 5$
	$5xy = 9$
	$xy = 45$

13 Convert the polar equation to a rectangular equation. $r = \dfrac{8}{1 + 3\sin\theta}$

a. $x^2 + 10y^2 - 64 = 0$

b. $x^2 - 8y^2 - 64 = 0$

c. $y^2 - 8x^2 - 64 = 0$

d. $x^2 - 8y^2 + 48y - 64 = 0$

e. $y^2 - 8x^2 + 48x - 64 = 0$

f. $y^2 + 10x^2 - 64 = 0$

14 Write the expression as an algebraic expression in v. $\cot\left(\sin^{-1} v\right)$

a. $\dfrac{1}{\sqrt{1 - v^2}}$

b. $\dfrac{v}{\sqrt{1 - v^2}}$

c. $\dfrac{1}{\sqrt{1 + v^2}}$

d. $\dfrac{v}{\sqrt{1 + v^2}}$

e. $\dfrac{\sqrt{1 + v^2}}{v}$

f. $\dfrac{\sqrt{1 - v^2}}{v}$

15 Express the area A of an equilateral triangle as a function of the length $7x$ of a side.

a. $A = \dfrac{7x^2}{4}$

b. $A = \dfrac{7x^2\sqrt{3}}{4}$

c. $A = \dfrac{49x^2}{4}$

d. $A = \dfrac{49x^2\sqrt{3}}{4}$

e. $A = \dfrac{49x^2\sqrt{3}}{2}$

f. $A = \dfrac{49x\sqrt{3}}{4}$

16 A pole tilts at an angle 3° from the vertical, away from the sun, and casts a shadow 23 feet long. The angle of elevation from the end of the pole's shadow to the top of the pole is 53°. To the nearest foot, how long is the pole?

a. 26 feet

b. 28 feet

c. 41 feet

d. 29 feet

e. 27 feet

f. 18 feet

17 Two ships leave port at 10:00 A.M. Ship # 1 travels at a bearing of $N26^\circ E$ at 19 mph and Ship # 2 travels at a bearing of $S20^\circ E$ at 26 mph. How far apart are the ships at noon?

a. $d(\text{ship 1, ship 2}) \approx 52$ mi

b. $d(\text{ship 1, ship 2}) \approx 84$ mi

c. $d(\text{ship 1, ship 2}) \approx 37.5$ mi

d. $d(\text{ship 1, ship 2}) \approx 83$ mi

e. $d(\text{ship 1, ship 2}) \approx 73$ mi

f. $d(\text{ship 1, ship 2}) \approx 112.4$ mi

18 Let $g(x) = \begin{cases} 4x - 7 & \text{if } x < -1 \\ |x| - 4 & \text{if } -1 \leq x \leq 3 \\ x^2 & \text{if } x > 3 \end{cases}$. As $x \to 3^+$, then $g(x) \to$ ____.

a. 16

b. -2

c. 9.61

d. -1

e. 9

f. impossible to determine

19 The ancillary circle of an ellipse is the circle with radius equal to half the length of the minor axis and a center the same as the ellipse. The ancillary circle is thus the largest circle that can fit within an ellipse. Find an equation for the ancillary circle of the ellipse $x^2 + 16y^2 = 256$.

a. $x^2 + y^2 = \frac{1}{16}$

b. $x^2 + y^2 = 4$

c. $x^2 + y^2 = 256$

d. $x^2 + y^2 = 16$

e. $x^2 + y^2 = \frac{1}{4}$

f. $x^2 + y^2 = 1$

20 Find the product of all solutions to the given equation in the interval $[0, 2\pi)$. Round the produce to three decimal places.

$\cos^2 x + 8\cos x = 8$

a. 2.578

b. 2.497

c. 2.448

d. 2.535

e. 2.643

f. 5.000

21 Let $f(x) = \frac{1}{x + 4}$. Compute and simplify the difference quotient $\frac{f(x) - f(5)}{x - 5}$.

a. $\frac{-1}{9x - 36}$

b. $\frac{13 - x}{9(x - 5)(x + 4)}$

c. $\frac{1}{9x + 36}$

d. $\frac{1}{9(x - 5)(x + 4)}$

e. $\frac{1}{9x - 36}$

f. $\frac{-1}{9x + 36}$

22 Find all the solutions of the equation $2\sin\frac{x}{3} = 1$ where *n* is an integer.

a. $x = \frac{\pi}{2} + 2\pi n$

b. $x = -\frac{\pi}{2} + 6\pi n$ or $x = \frac{\pi}{2} + 6\pi n$

c. $x = \frac{\pi}{2} + 6\pi n$ or $x = \frac{5\pi}{2} + 6\pi n$

d. $x = -\frac{5\pi}{2} + 2\pi n$ or $x = \frac{5\pi}{2} + 2\pi n$

e. $x = \frac{\pi}{2} + 2\pi n$ or $x = \frac{5\pi}{2} + 2\pi n$

f. $x = \frac{\pi}{6} + 2\pi n$ or $x = \frac{5\pi}{6} + 2\pi n$

23 Find $\csc t$ when the terminal side of an angle of t radians in standard position passes through the point $(-\pi, -4)$.

a. $\csc t = \frac{\pi}{4}$

b. $\csc t = \frac{4}{\pi}$

c. $\csc t = -\frac{4}{\sqrt{\pi^2 + 16}}$

d. $\csc t = -\frac{\sqrt{\pi^2 + 16}}{4}$

e. $\csc t = -\frac{\pi}{\sqrt{\pi^2 + 16}}$

f. $\csc t = -\frac{\sqrt{\pi^2 + 16}}{\pi}$

24 If $\sec t = -3$ and $\cot t < 0$, find $\cos\left(-t + \frac{\pi}{2}\right)$.

a. $\cos(-t + \frac{\pi}{2}) = \frac{3}{2\sqrt{2}}$

b. $\cos(-t + \frac{\pi}{2}) = -\frac{1}{3}$

c. $\cos(-t + \frac{\pi}{2}) = -\frac{2\sqrt{2}}{3}$

d. $\cos(-t + \frac{\pi}{2}) = \frac{2\sqrt{2}}{3}$

e. $\cos(-t + \frac{\pi}{2}) = -\frac{3}{2\sqrt{2}}$

f. $\cos(-t + \frac{\pi}{2}) = \frac{1}{3}$

25 Simplify the trigonometric expression $\sin B + \cos B \cot B$.

a. $\sec B$

b. $\cos B$

c. $\sin B$

d. $\tan B$

e. $\cot B$

f. $\csc B$

ANSWER KEY

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1. $\frac{2\pi}{3}, \frac{4\pi}{3}$ **2.** e **3.** d **4.** d **5.** b **6.** c **7.** e

8. b **9.** a,b,d,h **10.** f **11.** d **12.** $x = 9\sin t,\ y = 5\csc t \rightarrow xy = 45,$ $x = 5e^{4t},\ y = 9e^{-4t} \rightarrow 5xy = 9$ **13.** d **14.** f

15. d **16.** d **17.** d **18.** e **19.** d **20.** e **21.** f

22. c **23.** d **24.** d **25.** f