MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the length of the arc intercepted by the given central angle α in a circle of radius r.

1) $\alpha = \dfrac{3\pi}{4}$, r = 93.3 m   1) _____

    A) 390.8 m   B) 70 m   C) 219.8 m   D) 124.4 m

Solve.

2) An engine is "turning over" at an angular velocity of 2300 rpm. Express this angular velocity in   2) _____
rad/min.

    A) $\dfrac{2300}{\pi}$ rad/min   B) $4600\,\pi$ rad/min   C) $\dfrac{4600}{\pi}$ rad/min   D) $2300\,\pi$ rad/min

Solve the problem.

3) A wheel with a 24–inch diameter is turning at the rate of 32 revolutions per minute. To the nearest   3) _____
inch per minute, what is the linear velocity of a point on the rim?

    A) 2466 in./min   B) 2459 in./min   C) 2413 in./min   D) 2420 in./min

Solve the right triangle with the given sides and angles.

4) a = 3.9, b = 1.9   4) _____

    A) $\alpha = 29.2°$, $\beta = 60.8°$, c = 5.8   B) $\alpha = 59.5°$, $\beta = 30.5°$, c = 4.3

    C) $\alpha = 64.0°$, $\beta = 26.0°$, c = 4.3   D) $\alpha = 26.0°$, $\beta = 64.0°$, c = 4.3

Solve the problem.

5) Find cos (α), given that sin (α) = $\dfrac{2}{3}$ and cos (α) < 0.   5) _____

    A) $-\dfrac{\sqrt{5}}{3}$ B) $-\dfrac{1}{3}$ C) $\dfrac{1}{3}$ D) $\dfrac{\sqrt{5}}{3}$

Find the equation for the curve in its final position.

6) The graph y = sin (x) is shifted a distance of $\pi/4$ to the left, reflected in the x–axis, translated 8 units   6) _____
downward, then stretched by a factor of 6.

    A) $y = -6 \sin\left(x - \dfrac{\pi}{4}\right) + 48$ B) $y = -6 \sin\left(x + \dfrac{\pi}{4}\right) - 48$

    C) $y = -6 \sin\left(x - \dfrac{\pi}{4}\right) - 48$ D) $y = -6 \sin\left(x + \dfrac{\pi}{4}\right) - 8$

Find the phase shift for the given function.

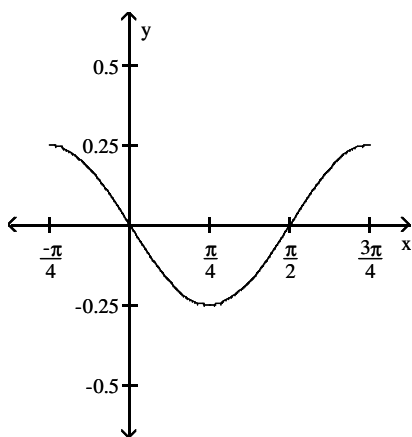7) Find the phase shift of $y = 4 - 2 \sin\left(5x - \dfrac{\pi}{4}\right)$.   7) _____

    A) $-\dfrac{\pi}{4}$ B) $-\dfrac{\pi}{20}$ C) $\dfrac{\pi}{8}$ D) $\dfrac{\pi}{20}$
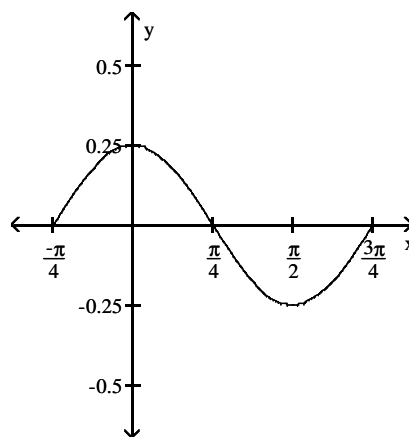
Graph the function over a one–period interval.

8) $y = \dfrac{1}{4} \cos\left(2\left[x + \dfrac{\pi}{4}\right]\right)$
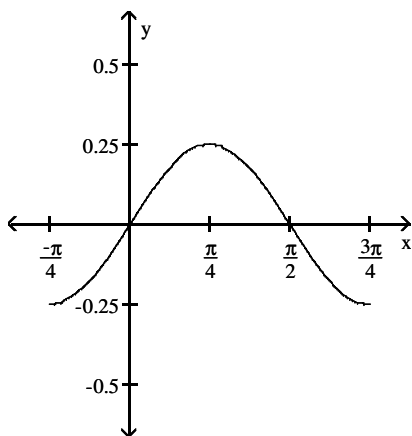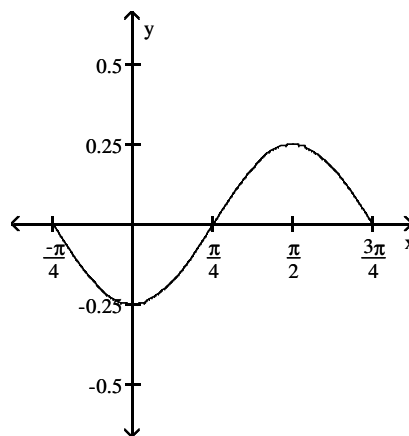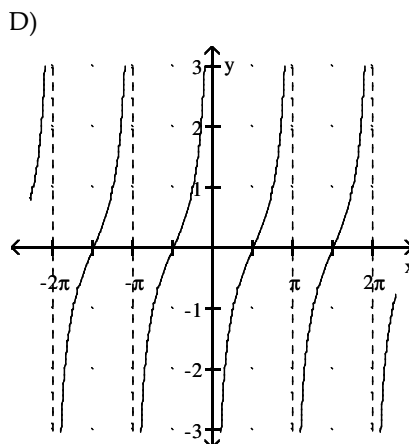
8) _____

A)

B)

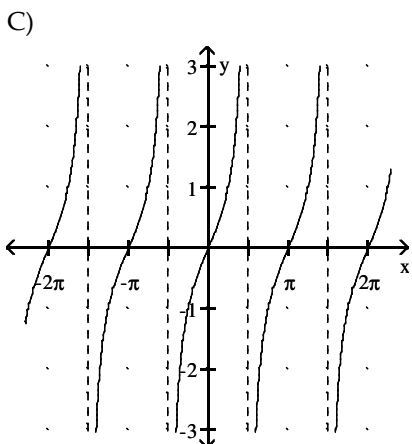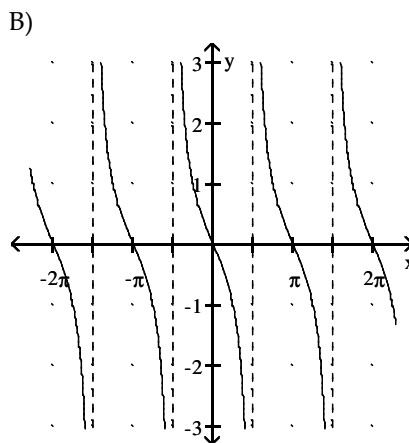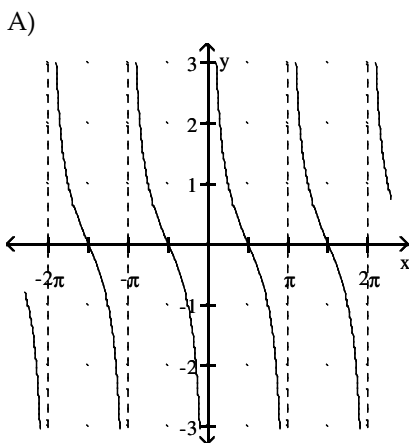C)

D)

Match each function with its graph.

9) 1) $y = \tan x$ 2) $y = \cot x$

   3) $y = -\tan x$ 4) $y = -\cot x$

9) _____

A)

B)

C)

D)

A) 1A, 2D, 3C, 4B   B) 1C, 2A, 3B, 4D   C) 1A, 2B, 3C, 4D   D) 1B, 2D, 3C, 4A

Evaluate the function.

10) Let $f(x) = \tan x$ and $g(x) = x + 9$. Find $f(g(-9))$.

10) _____

A) π B) 1   C) 0   D) Undefined

Use the fundamental identities to find an equivalent expression involving only sines and cosines, and then simplify it

11) $\csc \theta + \tan^2 \theta \csc \theta$

11) _____

A) $\dfrac{\sin \theta + \cos \theta}{\sin \theta \cos \theta}$ B) $\dfrac{1}{\sin \theta \cos \theta}$ C) $\dfrac{1}{\sin \theta \cos^2 \theta}$ D) $\cos \theta - \sin \theta$

Use the fundamental identities to find the value of the trigonometric function.

12) Find $\tan \alpha$ if $\sin \alpha = \dfrac{3}{4}$ and α is in quadrant II.

12) _____

A) $-\dfrac{3\sqrt{7}}{7}$ B) $-\dfrac{3}{2}$ C) $-\dfrac{\sqrt{7}}{9}$ D) $\dfrac{5}{4}$

3

Determine whether the function is odd, even, or neither.

13) $f(x) = x \sin x$ 13) _____

     A) Neither   B) Odd   C) Even

Use the sum/difference identities to simplify the expression. Do not use a calculator.

14) $\cos\dfrac{7\pi}{18}\cos\dfrac{2\pi}{9} + \sin\dfrac{7\pi}{18}\sin\dfrac{2\pi}{9}$ 14) _____

     A) $\cos\left(\dfrac{2\pi}{3}\right)$ B) $\cos\left(\dfrac{\pi}{3}\right)$ C) $\cos\left(\dfrac{\pi}{6}\right)$ D) $\cos\left(\dfrac{5\pi}{6}\right)$

Find cos(A + B).

15) $\sin A = -\dfrac{\sqrt{3}}{3}$ and $\sin B = -\dfrac{\sqrt{5}}{6}$, where $270° < A < 360°$ and $270° < B < 360°$.   15) _____

     A) $\dfrac{\sqrt{55} + \sqrt{15}}{18}$ B) $\dfrac{\sqrt{186} + \sqrt{15}}{18}$ C) $\dfrac{\sqrt{55} - \sqrt{15}}{18}$ D) $\dfrac{\sqrt{186} - \sqrt{15}}{18}$
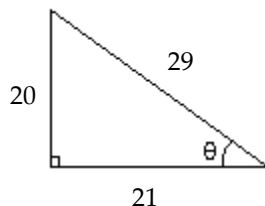
Solve the problem.

16)   16) _____

Find the exact value of sin 2θ.

     A) $\dfrac{43}{841}$ B) $\dfrac{41}{841}$ C) $-\dfrac{41}{841}$ D) $\dfrac{840}{841}$

Use the given information given to find the exact value of the trigonometric function.

17) $\sec\theta = -\dfrac{5}{4},$ θ lies in quadrant II   Find $\sin\dfrac{\theta}{2}$.   17) _____

     A) $\dfrac{\sqrt{10}}{10}$ B) $-\dfrac{\sqrt{10}}{10}$ C) $\dfrac{3\sqrt{10}}{10}$ D) $-\dfrac{3}{10}$

Find the exact value of the composition.

18) $\sin(\arctan(2))$ 18) _____

     A) $\dfrac{2\sqrt{5}}{5}$ B) $2\sqrt{5}$ C) $5\sqrt{2}$ D) $\dfrac{5\sqrt{2}}{2}$

Solve the equation for $0 \le t < 2\pi$. Approximate the solution to four decimal places.

19) $\sin t = \dfrac{5}{6}$ 19) _____

     A) 0.8481, 2.4119   B) 0.7297, 2.6180   C) 0.5236, 2.1565   D) 0.9851, 2.1565

Solve the equation for x.

20) $y = \cos (x + 12)$

20) _____

    A) $x = \arccos y - 12$ B) $x = \arccos (y + 12)$

    C) $x = \arccos (y - 12)$ D) $x = \arccos y + 12$

Find the inverse of the function, and state the domain and range of the inverse function.

21) $f(x) = 9 \sin (3x)$ for $-\dfrac{\pi}{6} \le x \le \dfrac{\pi}{6}$

21) _____

    A) $f^{-1}(x) = \dfrac{1}{3} \sin^{-1}\left(\dfrac{x}{9}\right)$; domain $= [-9, 9]$; range $= \left[-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right]$

    B) $f^{-1}(x) = \dfrac{1}{3} \sin^{-1}\left(\dfrac{x}{9}\right)$; domain $= [-9, 9]$; range $= \left[-\dfrac{\pi}{6}, \dfrac{\pi}{6}\right]$

    C) $f^{-1}(x) = \dfrac{1}{3} \sin^{-1}\left(\dfrac{x}{9}\right)$; domain $= [-9, 9]$; range $= \left[-\dfrac{\pi}{3}, \dfrac{\pi}{3}\right]$

    D) $f^{-1}(x) = \dfrac{1}{9} \sin^{-1}\left(\dfrac{x}{3}\right)$; domain $= [-9, 9]$; range $= \left[-\dfrac{\pi}{6}, \dfrac{\pi}{6}\right]$

Find all real numbers in [0, 2π] that satisfy the equation.

22) $\cos 2x = \dfrac{\sqrt{2}}{2}$

22) _____

    A) $\dfrac{\pi}{4}, \dfrac{3\pi}{4}, \dfrac{5\pi}{4}, \dfrac{7\pi}{4}$ B) $\dfrac{\pi}{8}, \dfrac{7\pi}{8}, \dfrac{9\pi}{8}, \dfrac{15\pi}{8}$

    C) $0, \dfrac{2\pi}{3}, \pi, \dfrac{4\pi}{3}$ D) no solution

Find all real numbers in the interval [0, 2π) that satisfy the equation.

23) $\sin^2 x + \sin x = 0$

23) _____

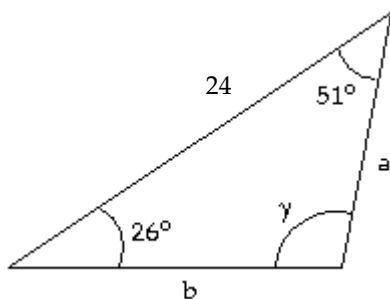   A) $\left\{0, \pi, \dfrac{\pi}{3}, \dfrac{2\pi}{3}\right\}$ B) $\left\{0, \pi, \dfrac{3\pi}{2}\right\}$ C) $\left\{0, \pi, \dfrac{4\pi}{3}, \dfrac{5\pi}{3}\right\}$ D) $\left\{0, \pi, \dfrac{\pi}{3}, \dfrac{5\pi}{3}\right\}$

Solve the triangle with the given parts.

24)

24) _____

    A) $\gamma = 103°$, $a = 53.3$, $b = 30.1$ B) $\gamma = 103°$, $a = 10.8$, $b = 19.1$

    C) $\gamma = 97°$, $a = 10.6$, $b = 18.8$ D) $\gamma = 103°$, $a = 19.1$, $b = 10.8$

Solve the triangle with the given information.

25) $a = 6.8$
 $b = 13.0$
 $c = 16.6$

A) $\alpha = 20.6°, \beta = 47.4°, \gamma = 111.9°$

B) $\alpha = 24.6°, \beta = 45.4°, \gamma = 109.9°$

C) $\alpha = 22.6°, \beta = 47.4°, \gamma = 109.9°$

D) No solution

25) _____

Find the area of triangle ABC.

26) $\alpha = 36.0°$
 $b = 12.0$
 $c = 5.3$

A) 18.7 B) 16.7 C) 25.7 D) 27.7

26) _____

Find the magnitudes of the horizontal and vertical components for the vector v with the given magnitude and given direction angle. Round to an appropriate number of significant digits.

27) $|\mathbf{v}| = 28.3, \theta = 81.7°$

A) $\left| v_x \right| = 28, \left| v_y \right| = 4.1$

B) $\left| v_x \right| = -4.1, \left| v_y \right| = -28$

C) $\left| v_x \right| = -28, \left| v_y \right| = -4.1$

D) $\left| v_x \right| = 4.1, \left| v_y \right| = 28$

27) _____

Find the magnitude and direction angle (to the nearest tenth) of the vector. Give the measure of the direction angle as an angle in [0°, 360°).

28) $\langle -12, 5 \rangle$

A) 13; 22.6° B) 13; 112.6° C) 15; 157.4° D) 13; 157.4°

28) _____

Find the component form for the vector v with the given magnitude and direction angle θ.

29) $|\mathbf{v}| = 181.1, \theta = 220.1°$

A) $\langle 138.5, -116.7 \rangle$ B) $\langle -138.5, 116.7 \rangle$ C) $\langle 138.5, 116.7 \rangle$ D) $\langle -138.5, -116.7 \rangle$

29) _____

Perform the indicated operation. Use the form <a, b> for vectors.

30) $\mathbf{v} = <2, 7>, \mathbf{u} = <2, 5>$; Find $8\mathbf{v} + 9\mathbf{u}$.

A) <34, 101> B) <72, 63> C) <648, 504> D) <32, 108>

30) _____

Find the smallest positive angle between the given vectors to the nearest tenth of a degree.

31) <-6, -7>, <5, 6>

A) 89.6° B) 179.2° C) 189.2° D) 79.6°

31) _____

Perform the specified calculation.

32) For the vectors $\mathbf{u} = \langle 2, 1 \rangle$ and $\mathbf{w} = \langle -1, 1 \rangle$, calculate $\left| -3\mathbf{u} \right| + \left| 4\mathbf{w} \right|$.

A) $3\sqrt{2} + 4\sqrt{5}$ B) $3\sqrt{5} - 4\sqrt{2}$ C) $-3\sqrt{5} + 4\sqrt{2}$ D) $3\sqrt{5} + 4\sqrt{2}$

32) _____

Find the magnitude of the resultant vector.

33) If $\mathbf{v} = -4\mathbf{i} + \mathbf{j}$ and $\mathbf{w} = -9\mathbf{i} + \mathbf{j}$

33) _____

    A) 5   B) $\sqrt{173}$ C) $\sqrt{233}$ D) $3\sqrt{11}$

Solve.

34) Two forces of 30 N and 70 N (newtons) act on an object. The angle between the forces is $40°$. Find the magnitude of the resultant and the angle that it makes with the smaller force.

34) _____

    A) 96 N, 28°   B) 8 N, 28°   C) 95 N, 28°   D) 94 N, 33°

Perform the requested evaluation.

35) Given $P(x) = x^2 - 10x + 41$, find $P(5 + 4i)$.

35) _____

    A) 8   B) i   C) 8i   D) 0

Find the absolute value of the complex number. Round your answer to two decimal places, if necessary.

36) $-6 + 3i$

36) _____

    A) 4.18   B) 9   C) 3.00   D) 6.71

Write the complex number in trigonometric form, using degree measure for the argument.

37) $-15 + 20i$

37) _____

    A) 25(cos 53.1° + i sin 53.1°)

    B) 25(cos 306.9° + i sin 306.9°)

    C) 25(cos 126.9° + i sin 126.9°)

    D) 25(cos 233.1° + i sin 233.1°)

Perform the indicated operation. Write the answer in the form a + bi.

38) $\dfrac{5(\cos 200° + i \sin 200°)}{4(\cos 50° + i \sin 50°)}$

38) _____

    A) $-\dfrac{1}{2} + \dfrac{\sqrt{3}}{2}i$ B) $-10 + 10\sqrt{3}i$ C) $-2 + 2\sqrt{3}i$ D) $-\dfrac{5\sqrt{3}}{8} + \dfrac{5}{8}i$

Use De Moivre's theorem to simplify the expression. Write the answer in a + bi form.

39) $(2(\cos 45° + i \sin 45°))^7$

39) _____

    A) $-1.414 - 1.414i$

    B) $-90.510 - 90.510i$

    C) $1.414 - 1.414i$

    D) $90.510 - 90.510i$

For the point given in rectangular coordinates, find equivalent polar coordinates (r, θ) for r > 0 and 0° ≤ θ < 360°.

40) $(4\sqrt{3}, 4)$

40) _____

    A) (4, 45°)   B) (8, 30°)   C) (16, 30°)   D) (8, 60°)

Eliminate the parameter of the pair of parametric equations.

41) $x = \sin t$, $y = 3 \cos t$

41) _____

    A) $x^2 + 9y^2 = 9$ B) $9x^2 + y^2 = 1$ C) $x^2 + 9y^2 = 1$ D) $9x^2 + y^2 = 9$

1) C
2) B
3) C
4) C
5) A
6) B
7) D
8) A
9) B
10) C
11) C
12) A
13) C
14) C
15) D
16) D
17) C
18) A
19) D
20) A
21) B
22) B
23) B
24) B
25) C
26) A
27) D
28) D
29) D
30) A
31) B
32) D
33) B
34) C
35) D
36) D
37) C
38) D
39) D
40) B
41) D