

Name _____

Complete the sentence so the result is an identity. Let x be any real number.

1) $\underline{\hspace{1cm}} = \frac{1}{\sin x}$

A) $\tan x$ B) $\csc x$ C) $\sec x$ D) $\cot x$

1) _____

2) $\sin x = (\underline{\hspace{1cm}})(\cos x)$

A) $\cot x$ B) $\sec x$ C) $\tan x$ D) $\csc x$

2) _____

Solve the equation for exact solutions over the interval $[0, 2\pi)$.

3) $\cos^2 x + 2 \cos x + 1 = 0$

A) $\left\{\frac{\pi}{2}, \frac{3\pi}{2}\right\}$

B) $\{2\pi\}$

C) $\{\pi\}$

D) $\left\{\frac{\pi}{4}, \frac{7\pi}{4}\right\}$

3) _____

4) $\cos x = \sin x$

A) $\left\{\frac{3\pi}{4}, \frac{7\pi}{4}\right\}$

B) $\left\{\frac{\pi}{4}, \frac{7\pi}{4}\right\}$

C) $\left\{\frac{\pi}{4}, \frac{5\pi}{4}\right\}$

D) $\left\{\frac{3\pi}{4}, \frac{5\pi}{4}\right\}$

4) _____

Write in terms of the cofunction of a complementary angle.

5) $\cos \frac{\pi}{20}$

A) $\sin \frac{9\pi}{20}$

B) $\sec \frac{19\pi}{20}$

C) $\sec \frac{9\pi}{20}$

D) $\sin \frac{19\pi}{20}$

5) _____

6) $\sec 68^\circ 34'$

A) $\cos 21^\circ 26'$

B) $\cos 111^\circ 26'$

C) $\csc 21^\circ 26'$

D) $\csc 22^\circ 34'$

6) _____

Determine all solutions of the equation in radians.

7) Find $\tan \frac{x}{2}$, given that $\tan x = -3$ and x terminates in $90^\circ < x < 180^\circ$.

A) $\frac{\sqrt{10}-1}{3}$

B) $\frac{\sqrt{10}+1}{3}$

C) $\frac{\sqrt{10}-1}{-3}$

D) $\frac{\sqrt{10}+1}{-3}$

7) _____

8) Find $\cos \frac{x}{2}$, given that $\cos x = \frac{1}{4}$ and x terminates in $0 < x < \frac{\pi}{2}$.

A) $\frac{\sqrt{8+2\sqrt{15}}}{4}$

B) $\frac{\sqrt{10}}{4}$

C) $\frac{\sqrt{8-2\sqrt{15}}}{4}$

D) $\frac{\sqrt{6}}{4}$

8) _____

Solve the problem.

9) Find the area of a triangular-shaped field with sides of 188.7 m and 197.5 m, and the included angle between them measuring 67.09° . Round to the nearest square meter.

A) $17,164 \text{ m}^2$

B) $34,328 \text{ m}^2$

C) 7254 m^2

D) $14,508 \text{ m}^2$

9) _____

Find the dot product for the pair of vectors.

- 10) $\langle -13, 10 \rangle, \langle 0, 9 \rangle$ 10) _____
 A) 103 B) -117 C) 90 D) 77

Find the component form of the indicated vector.

- 11) Let $\mathbf{u} = \langle -4, 4 \rangle$, $\mathbf{v} = \langle -3, -1 \rangle$. Find $-4\mathbf{u} + 2\mathbf{v}$. 11) _____
 A) $\langle 10, 3 \rangle$ B) $\langle 22, -14 \rangle$ C) $\langle 28, -12 \rangle$ D) $\langle 10, -18 \rangle$

- 12) Let $\mathbf{u} = \langle -9, -7 \rangle$. Find $-7\mathbf{u}$. 12) _____
 A) $\langle 63, -49 \rangle$ B) $\langle -63, -49 \rangle$ C) $\langle 63, 49 \rangle$ D) $\langle -63, 49 \rangle$

Find the indicated vector.

- 13) Let $\mathbf{u} = 3\mathbf{i}$, $\mathbf{v} = \mathbf{i} + \mathbf{j}$. Find $4\mathbf{u} - \mathbf{v}$. 13) _____
 A) $11\mathbf{i} + \mathbf{j}$ B) $11\mathbf{i} - 4\mathbf{j}$ C) $\mathbf{i} - 11\mathbf{j}$ D) $11\mathbf{i} - \mathbf{j}$

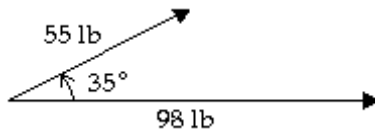
Find the magnitude and direction angle (to the nearest tenth) for each vector. Give the measure of the direction angle as an angle in $[0, 360^\circ]$.

- 14) $\langle -4, -3 \rangle$ 14) _____
 A) 5; 233.1° B) 5; 216.9° C) 7; 216.9° D) 5; 36.9°

- 15) $\langle \sqrt{14}, -1 \rangle$ 15) _____
 A) $\sqrt{15}$; 285° B) 15; 345° C) 15; 105° D) $\sqrt{15}$; 345°

Use the parallelogram rule to find the magnitude of the resultant force for the two forces shown in the figure. Round to one decimal place.

- 16) 16) _____



- A) 21,459.5 lb B) 180.3 lb C) 132.7 lb D) 146.5 lb

Two forces act at a point in the plane. The angle between the two forces is given. Find the magnitude of the resultant force.

- 17) forces of 46.4 and 60.2 lb, forming an angle of 126.7° 17) _____
 (round to the nearest pound)
 A) 101 lb B) 49 lb C) 95 lb D) 9116 lb

Find the angle between the pair of vectors to the nearest tenth of a degree.

- 18) $\langle -9, -1 \rangle, \langle -8, 7 \rangle$ 18) _____
 A) $^\circ$ B) 57.6° C) 23.8° D) 47.6°

- 19) $\langle 4, 5 \rangle, \langle -4, -1 \rangle$ 19) _____
 A) 71.4° B) 142.7° C) 152.7° D) 61.4°

Write the complex number in rectangular form.

- 20) $4(\cos 5^\circ + i \sin 5^\circ)$ 20) _____
 A) $2 + 0.2i$ B) $4 + 0.3i$ C) $-2 - 0.2i$ D) $0.3 + 4i$

Find an equivalent equation in rectangular coordinates.

21) $r = 10 \sin \theta$

A) $x^2 + y^2 = 10y$

B) $x^2 + y^2 = 10x$

C) $\sqrt{x^2 + y^2} = 10x$

D) $\sqrt{x^2 + y^2} = 10y$

21) _____

Determine two pairs of polar coordinates for the point with $0^\circ \leq \theta < 360^\circ$.

22) $(3\sqrt{3}, 9)$

A) $(6\sqrt{3}, 300^\circ), (-6\sqrt{3}, 60^\circ)$

B) $(6\sqrt{3}, 60^\circ), (-6\sqrt{3}, 240^\circ)$

C) $(6\sqrt{3}, 30^\circ), (-9\sqrt{3}, 330^\circ)$

D) $(6\sqrt{3}, 30^\circ), (-6\sqrt{3}, 330^\circ)$

22) _____

Give the rectangular coordinates for the point.

23) $(9, 30^\circ)$

A) $\left(\frac{-9\sqrt{3}}{2}, -\frac{9}{2}\right)$

B) $\left(\frac{9}{2}, \frac{-9\sqrt{3}}{2}\right)$

C) $\left(\frac{9}{2}, \frac{9\sqrt{3}}{2}\right)$

D) $\left(\frac{9\sqrt{3}}{2}, \frac{9}{2}\right)$

23) _____

24) $(4, 45^\circ)$

A) $(-2, -2\sqrt{2})$

B) $(\sqrt{2},)$

C) $(\sqrt{2}, \sqrt{2})$

D) $(-2\sqrt{2}, -2)$

24) _____

Find the given power. Write answer in rectangular form.

25) $(2 - 2i)^5$

A) $-\sqrt{2} + \sqrt{2}i$

B) $-128 + 128i$

C) $-64\sqrt{2} + 64\sqrt{2}i$

D) $-64 + 64i$

25) _____

26) $(-\sqrt{3} + i)^6$

A) -64

B) $-64\sqrt{3} + 64i$

C) $64i$

D) $64 - 64\sqrt{3}i$

26) _____

Write the complex number in trigonometric form $r(\cos \theta + i \sin \theta)$, with θ in the interval $[0^\circ, 360^\circ)$.

27) $-6 - 6i\sqrt{3}$

A) $12(\cos 240^\circ + i \sin 240^\circ)$

B) $12(\cos 180^\circ + i \sin 180^\circ)$

C) $12(\cos 290^\circ + i \sin 290^\circ)$

D) $6(\cos 240^\circ + i \sin 240^\circ)$

27) _____

28) $9\sqrt{3} + 9i$

A) $18(\cos 30^\circ + i \sin 30^\circ)$

B) $18(\cos 330^\circ + i \sin 330^\circ)$

C) $18(\cos 60^\circ + i \sin 60^\circ)$

D) $18(\cos 300^\circ + i \sin 300^\circ)$

28) _____

Write the complex number in rectangular form.

29) $6(\cos 330^\circ + i \sin 330^\circ)$

A) $-3\sqrt{3} - 3i$

B) $-3\sqrt{3} + 3i$

C) $3\sqrt{3} - 3i$

D) $3\sqrt{3} + 3i$

29) _____

Find the area of triangle ABC with the given parts. Round to the nearest tenth when necessary.

30) $a = 153 \text{ m}$

$b = 161 \text{ m}$

$c = 171 \text{ m}$

A) $16,869 \text{ m}^2$

B) 722 m^2

C) $11,246 \text{ m}^2$

D) $14,058 \text{ m}^2$

30) _____

Find the missing parts of the triangle. Round to the nearest tenth when necessary or to the nearest minute as appropriate.

- 31) $a = 26$ ft 31) _____
 $b = 39$ ft
 $c = 40$ ft
 A) $A = 38.4^\circ, B = 68.7^\circ, C = 72.9^\circ$ B) No triangle satisfies the given conditions.
 C) $A = 38.4^\circ, B = 34.4^\circ, C = 107.2^\circ$ D) $A = 68.7^\circ, B = 38.4^\circ, C = 72.9^\circ$
- 32) $B = 63^\circ 30'$ 32) _____
 $a = 12.2$ ft
 $c = 7.8$ ft
 A) No triangle satisfies the given conditions. B) $b = 11.2$ ft, $A = 77^\circ 49', C = 38^\circ 41'$
 C) $b = 13.2$ ft, $A = 73^\circ 07', C = 37^\circ 23'$ D) $b = 12.2$ ft, $A = 75^\circ 07', C = 41^\circ 23'$

Determine the number of triangles ABC possible with the given parts.

- 33) $b = 24, c = 29, B = 43^\circ$ 33) _____
 A) 1 B) 0 C) 3 D) 2
- 34) $a = 32, b = 65, A = 79^\circ$ 34) _____
 A) 3 B) 2 C) 1 D) 0

Find the area of triangle ABC with the given parts. Round to the nearest tenth when necessary.

- 35) $A = 39.7^\circ$ 35) _____
 $b = 11.8$ in.
 $c = 6.3$ in.
 A) 28.6 in.^2 B) 23.7 in.^2 C) 21.7 in.^2 D) 30.6 in.^2

Determine all solutions of the equation in radians.

- 36) Find $\sin \frac{\theta}{2}$, given that $\sin \theta = -\frac{3}{5}$ and θ terminates in $270^\circ < \theta < 360^\circ$. 36) _____
- A) $\frac{\sqrt{5}}{5}$ B) $-\frac{\sqrt{5}}{5}$ C) $\frac{\sqrt{10}}{10}$ D) $-\frac{\sqrt{30}}{10}$

Solve the equation in the interval $[0^\circ, 360^\circ)$. Give solutions to the nearest tenth, if necessary.

- 37) $\sin^2 \theta - \sin \theta - 12 = 0$ 37) _____
 A) $\{45^\circ, 135^\circ\}$ B) $\emptyset$ C) $\{45^\circ\}$ D) $\{45^\circ, 315^\circ\}$
- 38) $\sin 2\theta = -\sin \theta$ 38) _____
 A) $\{0^\circ, 120^\circ, 180^\circ, 240^\circ\}$ B) $\{0^\circ, 60^\circ, 120^\circ, 180^\circ, 240^\circ, 300^\circ\}$
 C) $\{0^\circ, 180^\circ\}$ D) $\{60^\circ, 120^\circ, 240^\circ, 300^\circ\}$

Give the exact value of the expression.

- 39) $\arccos(\cos \pi)$ 39) _____
 A) 0 B) $\frac{\pi}{3}$ C) $\frac{\pi}{2}$ D) π
- 40) $\cot \left(\sin^{-1} \frac{18}{30} \right)$ 40) _____
 A) $\frac{18}{30}$ B) $\frac{18}{24}$ C) $\frac{30}{18}$ D) $\frac{24}{18}$

Tell whether the statement is true or false.

41) $\cos \frac{17\pi}{72} = \cos \frac{\pi}{9} \cos \frac{\pi}{8} - \sin \frac{\pi}{9} \sin \frac{\pi}{8}$ 41) _____

A) True

B) False

42) $\cos \frac{\pi}{72} = \cos \frac{\pi}{9} \cos \frac{\pi}{8} - \sin \frac{\pi}{9} \sin \frac{\pi}{8}$ 42) _____

A) True

B) False

Find the exact value of the expression using the provided information.

43) Find $\cos(s + t)$ given that $\sin s = -\frac{1}{2}$, with s in quadrant IV, and $\sin t = \frac{1}{4}$, with t in quadrant II. 43) _____

A) $-\frac{4\sqrt{3} + \sqrt{15}}{11}$

B) $\frac{1 - 3\sqrt{5}}{8}$

C) $\frac{4\sqrt{3} - \sqrt{15}}{11}$

D) $\frac{1 + 3\sqrt{5}}{8}$

44) Find $\tan(s + t)$ given that $\sin s = \frac{1}{4}$, with s in quadrant II, and $\sin t = -\frac{1}{2}$, with t in quadrant IV. 44) _____

A) $\frac{4\sqrt{3} - \sqrt{15}}{11}$

B) $\frac{4\sqrt{3} + \sqrt{15}}{-11}$

C) $\frac{1 - 3\sqrt{5}}{8}$

D) $\frac{1 + 3\sqrt{5}}{8}$

45) Find $\cos(s + t)$ given that $\cos s = \frac{1}{3}$, with s in quadrant I, and $\sin t = -\frac{1}{2}$, with t in quadrant IV. 45) _____

A) $\frac{\sqrt{3} + 2\sqrt{2}}{6}$

B) $\frac{2\sqrt{6} + 1}{6}$

C) $\frac{\sqrt{3} - 2\sqrt{2}}{6}$

D) $\frac{2\sqrt{6} - 1}{6}$

46) Find $\tan(s + t)$ given that $\cos s = -\frac{12}{13}$, with s in quadrant II, and $\sin t = \frac{15}{17}$, with t in quadrant II. 46) _____

A) $-\frac{220}{21}$

B) $-\frac{220}{171}$

C) $\frac{20}{3}$

D) $-\frac{220}{221}$

Write the expression in terms of sine and cosine, and simplify so that no quotients appear in the final expression.

47) $\frac{\sin^2 x - 1}{\cos(-x)}$ 47) _____

A) $\sin x$

B) $-\sin x$

C) $-\cos x$

D) $\cos x$

48) $\sin^2 x (\cot^2 x + 1)$ 48) _____

A) -1

B) $\tan^2 x$

C) 1

D) $\cos^2 x + 1$

49) $(1 + \cot \theta)(1 - \cot \theta) - \csc^2 \theta$ 49) _____

A) $2 \cot^2 \theta$

B) 2

C) $-2 \cot^2 \theta$

D) 0

Use the fundamental identities to simplify the expression.

50) $\cos(-x) \cos x - \sin(-x) \sin x$ 50) _____

A) $\cos^2 x \sin^2 x$

B) 2

C) 1

D) 0

51) $\frac{\cos^2 x}{\sin^2 x} + \cos x \sec x$

A) $\csc^2 x$

B) $\sec^2 x$

C) $\csc x$

D) $\cot^2 x$

51) _____

Use an identity to write the expression as a single trigonometric function or as a single number.

52) $\frac{2 \tan 15^\circ}{1 - \tan^2 15^\circ}$

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

B) $\frac{\sqrt{2}}{4}$

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

D) $\sqrt{3}$

52) _____

53) $2 \cos^2 22.5^\circ - 1$

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

B) $\sqrt{3}$

C) $\frac{\sqrt{2}}{4}$

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

53) _____

Match the function with its graph.

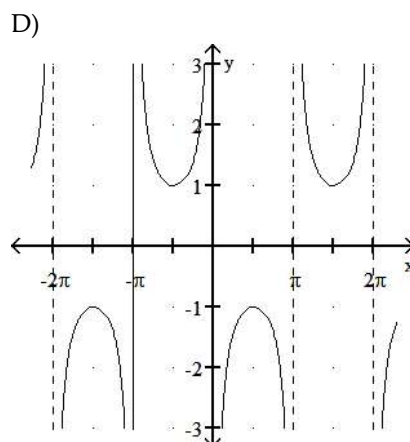
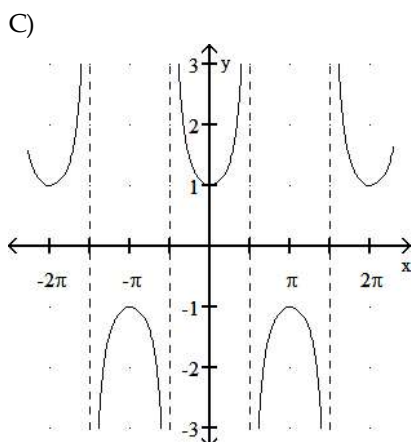
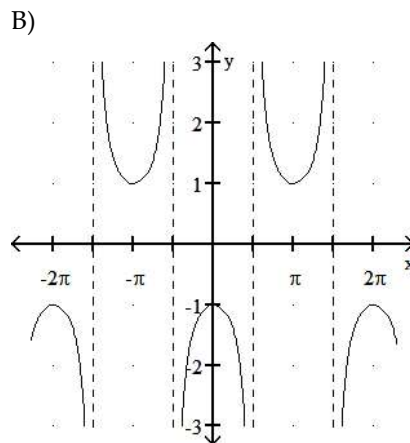
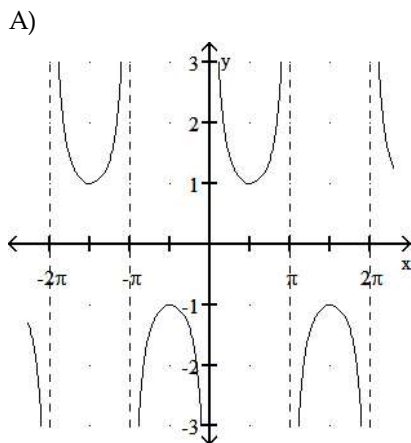
54) 1) $y = \sec x$

2) $y = \csc x$

3) $y = -\sec x$

4) $y = -\csc x$

54) _____



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

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

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

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

Solve the equation for exact solutions.

55) $\arctan x = \arcsin \frac{7}{25}$

55) _____

A) $\left\{\frac{7}{24}\right\}$

B) $\emptyset$

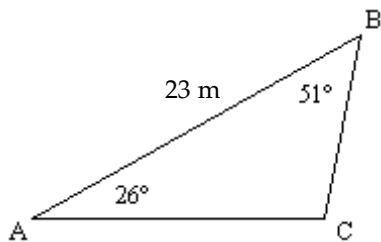
C) $\left\{\frac{25}{24}\right\}$

D) $\left\{\frac{24}{7}\right\}$

Solve the triangle. Round to the nearest tenth when necessary or to the nearest minute as appropriate.

56)

56) _____



A) $C = 97^\circ$, $a = 10.2$ m, $b = 18$ m

B) $C = 103^\circ$, $a = 51.1$ m, $b = 28.8$ m

C) $C = 103^\circ$, $a = 10.3$ m, $b = 18.3$ m

D) $C = 103^\circ$, $a = 18.3$ m, $b = 10.3$ m

57) $A = 20^\circ 10'$

57) _____

$B = 29^\circ 20'$

$a = 48$

A) $C = 130^\circ 30'$, $b = 105.9$, $c = 68.2$

B) $C = 130^\circ 30'$, $b = 68.2$, $c = 105.9$

C) $C = 131^\circ 30'$, $b = 68.2$, $c = 105.9$

D) $C = 131^\circ 30'$, $b = 105.9$, $c = 68.2$

Factor the trigonometric expression and simplify.

58) $\sin^2 x + \sin^2 x \cot^2 x$

58) _____

A) $\cot^2 x + 1$

B) $\sin^2 x + 1$

C) $\cot^2 x - 1$

D) 1

Solve the equation for solutions in the interval $[0, 2\pi)$.

59) $\sin 4x = \frac{\sqrt{3}}{2}$

59) _____

A) $\left\{\frac{\pi}{12}, \frac{\pi}{6}, \frac{2\pi}{3}, \frac{7\pi}{12}, \frac{7\pi}{6}, \frac{13\pi}{12}, \frac{5\pi}{3}, \frac{19\pi}{12}\right\}$

B) $\left\{\frac{\pi}{4}, \frac{5\pi}{4}\right\}$

C) $\left\{0, \frac{\pi}{4}, \pi\right\}$

D) $\{0\}$

Use a sum or difference identity to find the exact value.

60) $\tan \frac{\pi}{12}$

60) _____

A) $2 + \sqrt{3}$

B) $-2 - \sqrt{3}$

C) $-2 + \sqrt{3}$

D) $2 - \sqrt{3}$