Name_____                    Date: ___ / ___ / ___

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

**Convert the angle in degrees to radians. Express answer as a multiple of $\pi$.**

1) 36°                                                                                                          1) _____

    A) $\dfrac{\pi}{5}$ radians        B) $\dfrac{\pi}{6}$ radians        C) $\dfrac{\pi}{4}$ radians        D) $\dfrac{\pi}{7}$ radians

2) –60°                                                                                                       2) _____

    A) $-\dfrac{\pi}{2}$ radians      B) $-\dfrac{\pi}{4}$ radians      C) $-\dfrac{\pi}{3}$ radians      D) $-\dfrac{\pi}{5}$ radians

3) 135°                                                                                                       3) _____

    A) $\dfrac{1}{2}\pi$ radians      B) $\dfrac{3\pi}{4}$ radians      C) $\dfrac{4\pi}{5}$ radians      D) $\dfrac{2\pi}{3}$ radians

4) – 162°                                                                                                    4) _____

    A) $-\dfrac{4}{5}\pi$ radians     B) $-\dfrac{8\pi}{9}$ radians     C) $-\dfrac{10\pi}{11}$ radians     D) $-\dfrac{9\pi}{10}$ radians

**Convert the angle in radians to degrees.**

5) $\dfrac{11}{4}\pi$                                                                                          5) _____

    A) 990°          B) 164°          C) 495°          D) 65π°

6) $-\dfrac{\pi}{2}$                                                                                           6) _____

    A) $-\left(\dfrac{\pi}{2}\right)°$      B) –90π°      C) –2°      D) –90°

7) $\dfrac{5}{2}\pi$                                                                                           7) _____

    A) 900π°       B) 8°       C) 225°       D) 450°

**Draw the angle in standard position.**

8) $-\dfrac{3\pi}{4}$                                                                                          8) _____

9) $\dfrac{7\pi}{4}$                                                                                           9) _____

10) $\dfrac{13\pi}{6}$                                                                                         10) _____

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

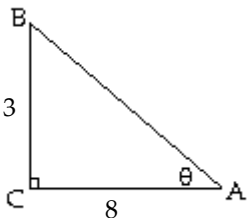**Find a positive angle less than 360° or 2π that is coterminal with the given angle.**

11) –7°

    A) 533°          B) 173°          C) 7°          D) 353°

12) $\dfrac{16\pi}{5}$

12) _____

    A) $\dfrac{6\pi}{5}$          B) $\dfrac{11\pi}{5}$          C) $-\dfrac{16\pi}{5}$          D) $\dfrac{4\pi}{5}$
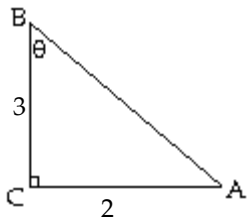
13) 538°

13) _____

    A) 358°          B) 178°          C) 269°          D) 168°

**Use the Pythagorean Theorem to find the length of the missing side.Then find the indicated trigonometric function of the given angle. Give an exact answer with a rational denominator.**

14) Find sin θ.

14) _____



    A) $\dfrac{8\sqrt{73}}{73}$          B) $\dfrac{\sqrt{73}}{8}$          C) $\dfrac{\sqrt{73}}{3}$          D) $\dfrac{3\sqrt{73}}{73}$

15) Find csc θ.

15) _____



    A) $\dfrac{\sqrt{13}}{3}$          B) $\dfrac{\sqrt{13}}{2}$          C) $\dfrac{2\sqrt{13}}{13}$          D) $\dfrac{3\sqrt{13}}{13}$
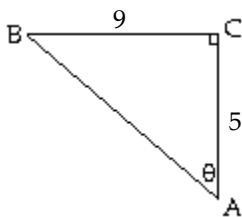
16) Find cos θ.

16) _____
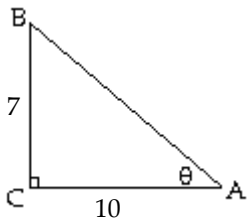


    A) $\dfrac{\sqrt{149}}{7}$          B) $\dfrac{10\sqrt{149}}{149}$          C) $\dfrac{7\sqrt{149}}{149}$          D) $\dfrac{\sqrt{149}}{10}$

17) Find tan θ.



A) $\dfrac{\sqrt{106}}{9}$
B) $\dfrac{\sqrt{106}}{5}$
C) $\dfrac{9}{5}$
D) $\dfrac{5}{9}$

17) _____

**Find a cofunction with the same value as the given expression.**

18) sin 83°

A) cos 83°
B) cot 7°
C) cos 7°
D) tan 7°

18) _____

19) cos 69°

A) sin 21°
B) sec 69°
C) sin 69°
D) csc 21°

19) _____

20) tan 22°

A) cot 112°
B) cot 22°
C) cot 68°
D) sec 22°

20) _____

21) csc 24°

A) sec 24°
B) sec 114°
C) sin 24°
D) sec 66°

21) _____

**A point on the terminal side of angle θ is given. Find the exact value of each of the six trigonometric functions of θ, or state that the function is undefined.**

22) (2, –3)

22) _____

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

**Let θ be an angle in standard position. Name the quadrant in which the angle θ lies.**

23) csc θ > 0,    sec θ > 0

A) quadrant I
B) quadrant IV
C) quadrant II
D) quadrant III

23) _____

**Find the exact value of the each of the remaining trigonometric functions of θ.**

24) $\cot \theta = -\dfrac{9}{4},\ \cos \theta < 0$

24) _____

25) $\sin \theta = -\dfrac{2}{3},\ \tan \theta > 0$

25) _____

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

**Determine the amplitude or period as requested.**

26) Period of $y = 5 \cos \dfrac{1}{2}x$

A) 5
B) $4\pi$
C) $\dfrac{\pi}{2}$
D) $\dfrac{5\pi}{2}$

26) _____

27) Period of $y = 2 \sin 6\pi x$

27) _____

A) $\dfrac{\pi}{3}$ 　　　　　　 B) $\dfrac{1}{3}$ 　　　　　　 C) 3 　　　　　　 D) $6\pi$

**Determine the phase shift of the function.**

28) $y = \dfrac{1}{4} \sin (4x + \pi)$

28) _____

　　A) $\pi$ units to the left 　　　　　　 B) $\dfrac{\pi}{4}$ units to the left

　　C) $-\dfrac{\pi}{4}$ units to the left 　　　　　　 D) $\dfrac{\pi}{4}$ units to the right

29) $y = 5 \sin \left( x - \dfrac{\pi}{4} \right)$

29) _____

　　A) 5 units up 　　　　　　 B) $\dfrac{\pi}{4}$ units to the left

　　C) 5 units down 　　　　　　 D) $\dfrac{\pi}{4}$ units to the right

**Graph the function.**
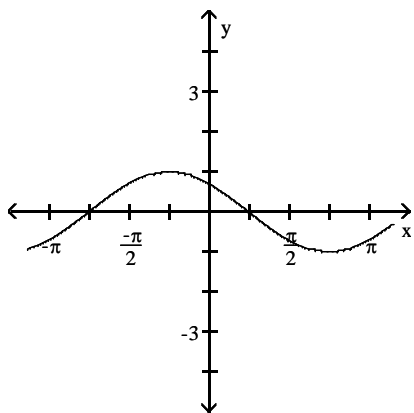
30) $y = 3 \sin 3x$

30) _____
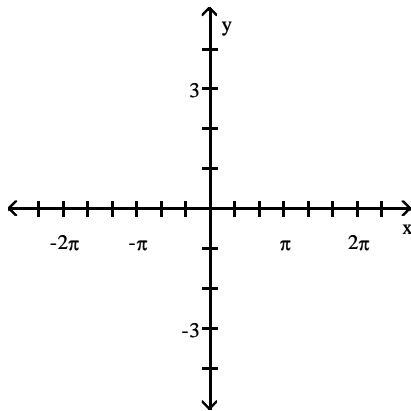


**MULTIPLE CHOICE.  Choose the one alternative that best completes the statement or answers the question.**

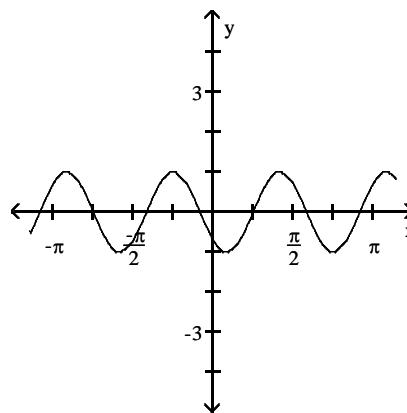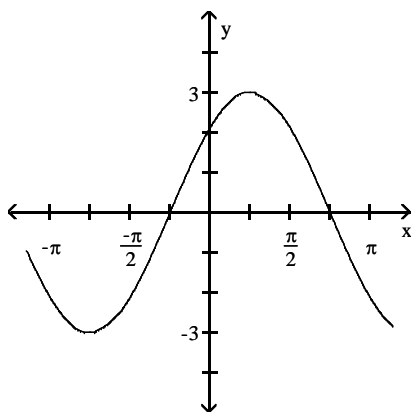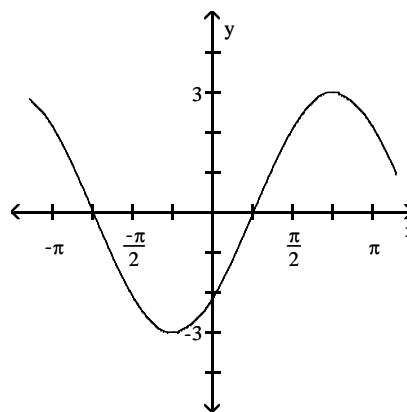31) $y = 3 \sin \left( x + \dfrac{\pi}{4} \right)$

31) _____



4
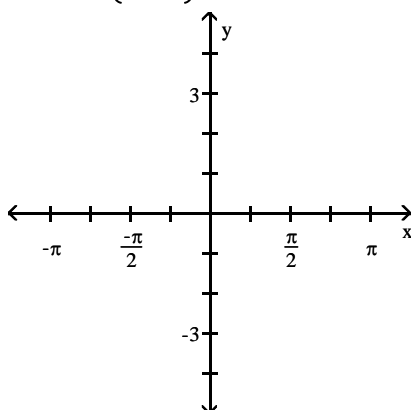
A)



B)



C)



D)



**Determine the amplitude or period as requested.**

32) Period of $y = \dfrac{3}{4} \cos\left(-\dfrac{8\pi}{7}x\right)$

32) _____

    A) $\dfrac{7}{4}$          B) $\dfrac{2}{3}$          C) $\dfrac{3\pi}{2}$          D) $\dfrac{16\pi}{7}$

**Determine the phase shift of the function.**

33) $y = 2 \cos\left(x + \dfrac{\pi}{4}\right)$

33) _____

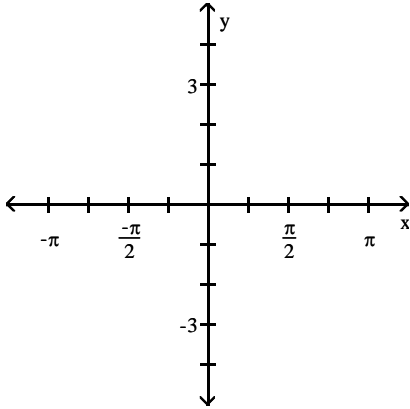    A) 2 units up                  B) $\dfrac{\pi}{4}$ units to the left

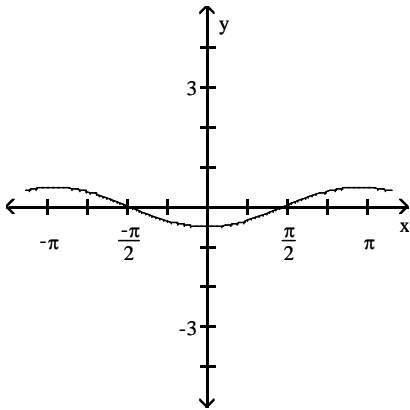    C) 2 units down                D) $\dfrac{\pi}{4}$ units to the right

**Graph the function.**

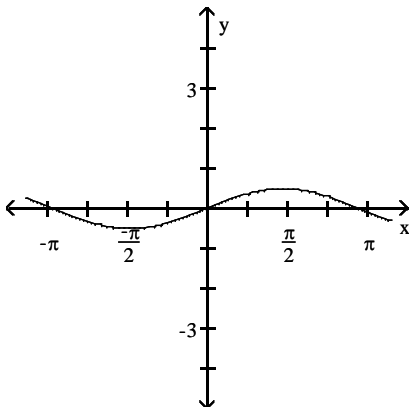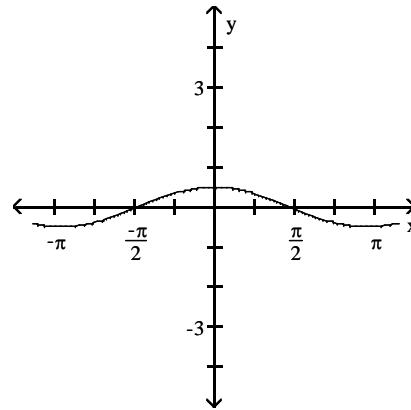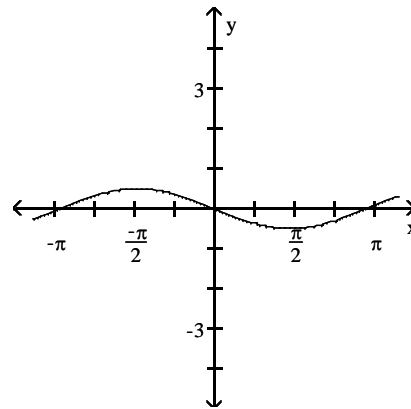34) $y = -\frac{1}{2} \cos \frac{\pi}{3} x$
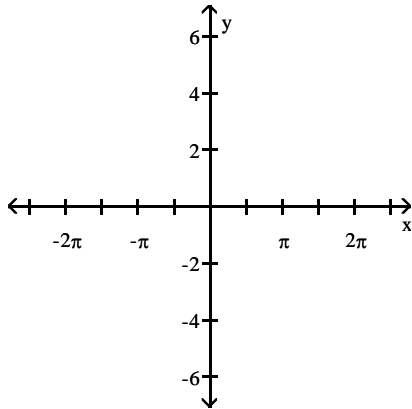
34) _____

A)

B)

C)

D)

**Use a vertical shift to graph the function.**
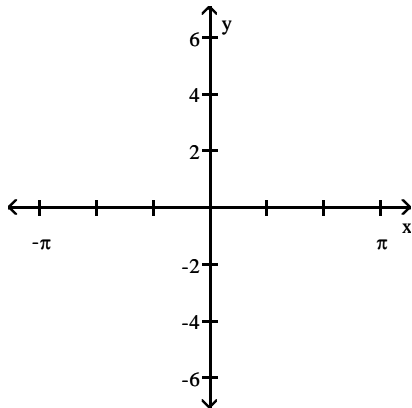
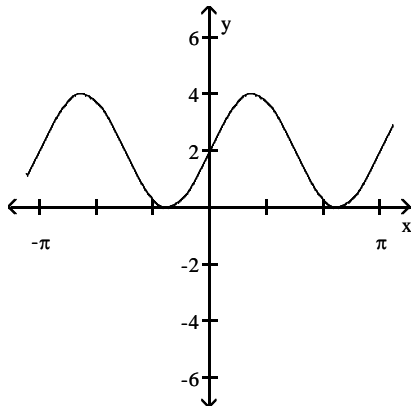35) $y = 2 \sin \dfrac{1}{2}x - 2$

35) _____

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

36) $y = 2 \cos\left(2x - \dfrac{\pi}{2}\right) + 2$

36) _____

A)

B)

7
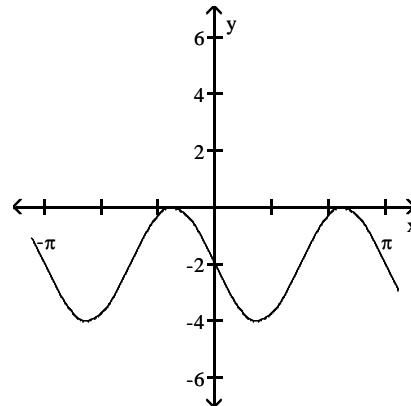
C)
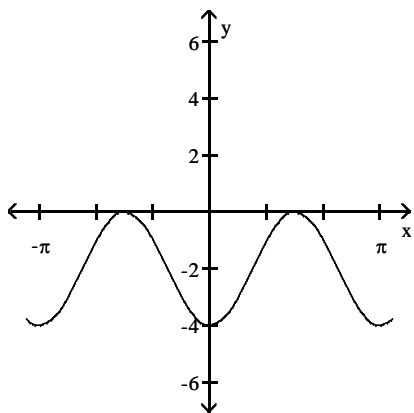


D)
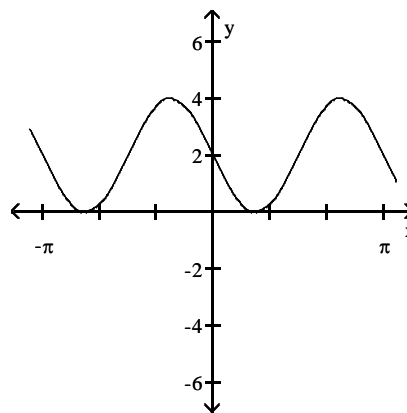


**Determine the phase shift of the function.**

37) $y = 2 \cos(3\pi x - 2)$

    A) $\frac{2}{3}$ units to the left

                               B) 2 units to the left

    C) 2 units to the right

                               D) $\frac{2}{3\pi}$ units to the right

37) _____

**Complete the identity.**

38) $\dfrac{(\sin x + \cos x)^2}{1 + 2 \sin x \cos x} = ?$

    A) 1                   B) $1 - \sin x$          C) $-\sec^2 x$          D) 0

38) _____

39) $\sin^2 x + \sin^2 x \cot^2 x = ?$

    A) $\cot^2 x + 1$          B) 1                 C) $\sin^2 x + 1$          D) $\cot^2 x - 1$

39) _____

40) $\dfrac{\cos x + \sin x}{\cos x} - \dfrac{\sin x - \cos x}{\sin x} = ?$

    A) $1 - \sec x \csc x$        B) $\sec x \csc x$        C) $2 + \sec x \csc x$        D) $2 - \sec x \csc x$

40) _____

    **Simplify the given expression:**

41) $\dfrac{(\sec x + 1)(\sec x - 1)}{\tan^2 x} = ?$

41) _____

42) $\tan^2 2x + \cos^2 2x + \sin^2 2x = ?$

42) _____

43) $1 - \dfrac{\cos^2 x}{1 + \sin x} = ?$

43) _____

8

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

44) $\dfrac{1 - \cos x}{\sin x} = ?$

44) _____

    A) $-\csc x - \cot x$      B) $\csc x - \cot x$      C) $\csc x + \cot x$      D) $\csc x - \cot x + 1$

45) $\sec^2 x \csc^2 x = ?$

45) _____

    A) $\sec x + \csc x$      B) $\sec^2 x - \csc^2 x$      C) $\csc^2 x - \sec^2 x$      D) $\sec^2 x + \csc^2 x$

**Verify the identity.**

46) $\csc^2 u - \cos u \sec u = \cot^2 u$

46) _____

47) $(1 + \tan^2 u)(1 - \sin^2 u) = 1$

47) _____

48) $\csc u - \sin u = \cos u \cot u$

48) _____

49) $1 + \sec^2 x \sin^2 x = \sec^2 x$

49) _____

50) $\cot^2 x + \csc^2 x = 2 \csc^2 x - 1$

50) _____

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

**Find the exact value of the expression.**

51) $\cos (175°) \cos (55°) + \sin (175°) \sin (55°)$

51) _____

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

**Complete the identity.**

52) $\cos\left(x - \dfrac{5\pi}{6}\right) = ?$ 

    A) $-\dfrac{\sqrt{3}}{2}(\cos x + \sin x)$               B) $\dfrac{1}{2}(-\sqrt{3}\cos x + \sin x)$

    C) $\dfrac{\sqrt{3}}{2}(\cos x - \sin x)$               D) $-\dfrac{\sqrt{3}}{2}(\cos x - \sin x)$

52) _____

**Use the given information to find the exact value of the expression.**

53) $\sin\alpha = \dfrac{4}{5}$, $\alpha$ lies in quadrant II, and $\cos\beta = \dfrac{2}{5}$, $\beta$ lies in quadrant I     Find $\cos(\alpha - \beta)$.

    A) $\dfrac{8 - 3\sqrt{21}}{25}$     B) $\dfrac{6 - 4\sqrt{21}}{25}$     C) $\dfrac{-6 + 4\sqrt{21}}{25}$     D) $\dfrac{8 + 3\sqrt{21}}{25}$

53) _____

**Find the exact value by using a sum or difference identity.**

54) $\sin(215° - 95°)$

    A) $-\dfrac{1}{2}$        B) $-\dfrac{\sqrt{3}}{2}$        C) $-\dfrac{43}{12}$        D) $\dfrac{\sqrt{3}}{2}$

54) _____

55) $\sin 165°$

    A) $-\dfrac{\sqrt{2}(\sqrt{3} - 1)}{4}$     B) $\dfrac{\sqrt{2}(\sqrt{3} - 1)}{4}$     C) $-\dfrac{\sqrt{2}(\sqrt{3} + 1)}{4}$     D) $\dfrac{\sqrt{2}(\sqrt{3} + 1)}{4}$

55) _____

**Find the exact value of the expression.**

56) $\cos 35° \cos 25° - \sin 35° \sin 25°$

    A) $\dfrac{1}{2}$        B) $\sqrt{3}$        C) $\dfrac{1}{4}$        D) $\dfrac{\sqrt{3}}{2}$

56) _____

57) $\cos\dfrac{2\pi}{9}\sin\dfrac{\pi}{18} - \cos\dfrac{\pi}{18}\sin\dfrac{2\pi}{9}$

    A) $\dfrac{1}{4}$        B) $\dfrac{\sqrt{3}}{2}$        C) 1        D) $\dfrac{1}{2}$

57) _____

**Use the given information to find the exact value of the expression.**

58) $\sin\alpha = \dfrac{24}{25}$, $\alpha$ lies in quadrant I, and $\cos\beta = \dfrac{8}{17}$, $\beta$ lies in quadrant I     Find $\cos(\alpha + \beta)$.

    A) $\dfrac{297}{425}$     B) $\dfrac{416}{425}$     C) $-\dfrac{304}{425}$     D) $\dfrac{87}{425}$

58) _____

59) $\sin\alpha = \dfrac{12}{13}$, $\alpha$ lies in quadrant II, and $\cos\beta = \dfrac{3}{5}$, $\beta$ lies in quadrant I     Find $\sin(\alpha - \beta)$.

    A) $-\dfrac{33}{65}$     B) $\dfrac{63}{65}$     C) $\dfrac{56}{65}$     D) $\dfrac{16}{65}$

59) _____

60) $\tan \alpha = \dfrac{4}{3}$, $\alpha$ lies in quadrant III, and $\cos \beta = -\dfrac{20}{29}$, $\beta$ lies in quadrant II    Find $\sin (\alpha + \beta)$.    60) _____

   A) $\dfrac{17}{145}$          B) $\dfrac{144}{145}$          C) $\dfrac{143}{145}$          D) $-\dfrac{24}{145}$

61) $\sin \alpha = \dfrac{7}{25}$, $\alpha$ lies in quadrant II, and $\cos \beta = \dfrac{2}{5}$, $\beta$ lies in quadrant I    Find $\cos (\alpha - \beta)$.    61) _____

   A) $\dfrac{14 - 24\sqrt{21}}{125}$     B) $\dfrac{14 + 24\sqrt{21}}{125}$     C) $\dfrac{-48 + 7\sqrt{21}}{125}$     D) $\dfrac{48 - 7\sqrt{21}}{125}$

**Find the exact value by using a difference identity.**

62) $\tan 255°$    62) _____

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

**Use trigonometric identities to find the exact value.**

63) $\dfrac{\tan 40° + \tan 110°}{1 - \tan 40° \tan 110°}$    63) _____

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

**Find the exact value under the given conditions.**

64) $\tan \alpha = \dfrac{15}{8}$, $\pi < \alpha < \dfrac{3\pi}{2}$; $\cos \beta = -\dfrac{21}{29}$, $\dfrac{\pi}{2} < \beta < \pi$    Find $\tan (\alpha + \beta)$.    64) _____
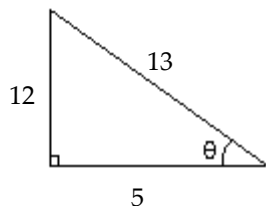
   A) $\dfrac{155}{493}$          B) $\dfrac{468}{493}$          C) $\dfrac{155}{468}$          D) $-\dfrac{11}{39}$

65) $\cos \alpha = -\dfrac{7}{25}$, $\dfrac{\pi}{2} < \alpha < \pi$; $\sin \beta = -\dfrac{\sqrt{21}}{5}$, $\pi < \beta < \dfrac{3\pi}{2}$    Find $\tan (\alpha + \beta)$.    65) _____

   A) $\dfrac{48 - 7\sqrt{21}}{14 + 24\sqrt{21}}$     B) $\dfrac{14 + 24\sqrt{21}}{-48 + 7\sqrt{21}}$     C) $\dfrac{-48 + 7\sqrt{21}}{125}$     D) $\dfrac{-48 + 7\sqrt{21}}{14 + 24\sqrt{21}}$

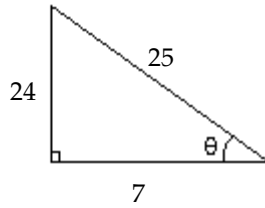**Use the figure to find the exact value of the trigonometric function.**

66) Find $\sin 2\theta$.    66) _____



   A) $\dfrac{120}{169}$          B) $-\dfrac{121}{169}$          C) $-\dfrac{119}{169}$          D) $\dfrac{119}{169}$

67) Find tan 2θ.

67) _____



25
24
θ
7

A) $-\dfrac{336}{527}$  B) $-\dfrac{527}{625}$  C) $\dfrac{528}{527}$  D) $\dfrac{336}{625}$

**Use the given information to find the exact value of the expression.**

68) $\sin\theta = \dfrac{4}{5}$, θ lies in quadrant I    Find $\cos 2\theta$.

68) _____

A) $-\dfrac{8}{25}$  B) $-\dfrac{7}{25}$  C) $\dfrac{24}{25}$  D) $\dfrac{7}{25}$

69) $\cos\theta = \dfrac{21}{29}$, θ lies in quadrant IV    Find $\sin 2\theta$.

69) _____

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

70) $\tan\theta = \dfrac{15}{8}$, θ lies in quadrant III    Find $\sin 2\theta$.

70) _____

A) $-\dfrac{161}{289}$  B) $\dfrac{240}{289}$  C) $\dfrac{161}{289}$  D) $-\dfrac{240}{289}$

**Write the expression as the sine, cosine, or tangent of a double angle. Then find the exact value of the expression.**

71) $\cos^2 15° - \sin^2 15°$

71) _____

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

72) $\dfrac{2\tan\dfrac{\pi}{8}}{1-\tan^2\dfrac{\pi}{8}}$

72) _____

A) $\sqrt{2}$  B) 1  C) $\dfrac{\sqrt{2}}{2}$  D) –1

**Use a half–angle formula to find the exact value of the expression.**

73) $\sin 165°$

73) _____

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

74) $\cos \dfrac{5\pi}{12}$

74) _____

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

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

75) $\sin \theta = \dfrac{1}{4}, \ \tan \theta > 0$      Find $\cos \dfrac{\theta}{2}$.

75) _____

    A) $\dfrac{\sqrt{8 - 2\sqrt{15}}}{4}$
    B) $\dfrac{\sqrt{10}}{4}$
    C) $\dfrac{\sqrt{6}}{4}$
    D) $\dfrac{\sqrt{8 + 2\sqrt{15}}}{4}$

76) $\cos \theta = -\dfrac{3}{5}, \ \sin \theta > 0$      Find $\cos \dfrac{\theta}{2}$.

76) _____

    A) $\dfrac{\sqrt{30}}{10}$
    B) $\dfrac{\sqrt{5}}{5}$
    C) $-\dfrac{\sqrt{30}}{10}$
    D) $-\dfrac{\sqrt{5}}{5}$

77) $\csc \theta = -\dfrac{4}{3}, \ \tan \theta > 0$      Find $\cos \dfrac{\theta}{2}$.

77) _____

    A) $-\dfrac{\sqrt{8 - 2\sqrt{7}}}{4}$
    B) $\dfrac{\sqrt{8 + 2\sqrt{7}}}{4}$
    C) $-\dfrac{\sqrt{4 + \sqrt{7}}}{8}$
    D) $\dfrac{\sqrt{7}}{8}$

**Find all solutions of the equation.**

78) $2 \sin x - \sqrt{3} = 0$

78) _____

    A) $x = \dfrac{\pi}{3} + n\pi$ or $x = \dfrac{2\pi}{3} + n\pi$
        B) $x = \dfrac{\pi}{6} + 2n\pi$ or $x = \dfrac{5\pi}{3} + 2n\pi$

    C) $x = \dfrac{\pi}{6} + n\pi$ or $x = \dfrac{5\pi}{3} + n\pi$
        D) $x = \dfrac{\pi}{3} + 2n\pi$ or $x = \dfrac{2\pi}{3} + 2n\pi$

79) $\tan x \sec x = -2 \tan x$

79) _____

    A) $x = \dfrac{\pi}{3} + 2n\pi$ or $x = \dfrac{5\pi}{3} + 2n\pi$ or $x = n\pi$
        B) $x = \dfrac{\pi}{3} + n\pi$ or $x = \dfrac{5\pi}{3} + n\pi$ or $x = n\pi$

    C) $x = \dfrac{2\pi}{3} + 2n\pi$ or $x = \dfrac{4\pi}{3} + 2n\pi$ or $x = n\pi$
        D) $x = \dfrac{2\pi}{3} + n\pi$ or $x = \dfrac{4\pi}{3} + n\pi$ or $x = n\pi$

**Solve the equation on the interval $[0, 2\pi)$.**

80) $\sin 4x = \dfrac{\sqrt{3}}{2}$

80) _____

    A) $0$
        B) $0, \dfrac{\pi}{4}, \pi$

    C) $\dfrac{\pi}{4}, \dfrac{5\pi}{4}$
        D) $\dfrac{\pi}{12}, \dfrac{\pi}{6}, \dfrac{2\pi}{3}, \dfrac{7\pi}{12}, \dfrac{7\pi}{6}, \dfrac{13\pi}{12}, \dfrac{5\pi}{3}, \dfrac{19\pi}{12}$

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

81) _____

    A) $\pi$
    B) $\dfrac{\pi}{4}, \dfrac{7\pi}{4}$
    C) $2\pi$
    D) $\dfrac{\pi}{2}, \dfrac{3\pi}{2}$

82) $2 \sin^2 x = \sin x$                                                                                   82) _____

    A) $\dfrac{\pi}{6}, \dfrac{5\pi}{6}$      B) $\dfrac{\pi}{3}, \dfrac{2\pi}{3}$      C) $0, \pi, \dfrac{\pi}{6}, \dfrac{5\pi}{6}$      D) $\dfrac{\pi}{2}, \dfrac{3\pi}{2}, \dfrac{\pi}{3}, \dfrac{2\pi}{3}$

83) $\cos x = \sin x$                                                                                        83) _____

    A) $\dfrac{\pi}{4}, \dfrac{7\pi}{4}$      B) $\dfrac{\pi}{4}, \dfrac{5\pi}{4}$      C) $\dfrac{3\pi}{4}, \dfrac{7\pi}{2}$      D) $\dfrac{3\pi}{4}, \dfrac{5\pi}{4}$

**Solve the equation on the interval $[0, 2\pi)$.**

84) $\cot^2 x \cos x = \cot^2 x$                                                                             84) _____

    A) $0, \dfrac{\pi}{2}$      B) $\dfrac{\pi}{2}, \dfrac{3\pi}{2}$      C) $0, \dfrac{3\pi}{2}$      D) $\dfrac{\pi}{2}, 2\pi$

**Solve the equation on the interval $[0, 2\pi)$.**

85) $\sec^2 x - 2 = \tan^2 x$                                                                                85) _____

    A) $\dfrac{\pi}{6}$      B) no solution      C) $\dfrac{\pi}{3}$      D) $\dfrac{\pi}{4}$

86) $\cos 2x = \dfrac{\sqrt{2}}{2}$                                                                          86) _____

    A) $0, \dfrac{2\pi}{3}, \pi, \dfrac{4\pi}{3}$          B) $\dfrac{\pi}{4}, \dfrac{3\pi}{4}, \dfrac{5\pi}{4}, \dfrac{7\pi}{4}$

    C) $\dfrac{\pi}{8}, \dfrac{7\pi}{8}, \dfrac{9\pi}{8}, \dfrac{15\pi}{8}$          D) no solution

87) $\sin^2 2x = 1$                                                                                          87) _____

    A) $0, \dfrac{2\pi}{3}, \pi, \dfrac{4\pi}{3}$          B) $\dfrac{\pi}{4}, \dfrac{3\pi}{4}, \dfrac{5\pi}{4}, \dfrac{7\pi}{4}$

    C) $\dfrac{\pi}{8}, \dfrac{9\pi}{8}$          D) no solution

88) $\cos 2x = \sqrt{2} - \cos 2x$                                                                           88) _____

    A) $0, \dfrac{2\pi}{3}, \pi, \dfrac{4\pi}{3}$          B) $\dfrac{\pi}{4}, \dfrac{3\pi}{4}, \dfrac{5\pi}{4}, \dfrac{7\pi}{4}$

    C) $\dfrac{\pi}{8}, \dfrac{7\pi}{8}, \dfrac{9\pi}{8}, \dfrac{15\pi}{8}$          D) no solution

89) $\sin 2x + \sin x = 0$                                                                                   89) _____

    A) $\dfrac{\pi}{8}, \dfrac{9\pi}{8}$          B) $0, \dfrac{2\pi}{3}, \pi, \dfrac{4\pi}{3}$

    C) $\dfrac{\pi}{4}, \dfrac{3\pi}{4}, \dfrac{5\pi}{4}, \dfrac{7\pi}{4}$          D) no solution

**Use a calculator to solve the equation on the interval $[0, 2\pi)$. Round the answer to two decimal places.**

90) $\cos x = 0.74$                                                                                          90) _____

    A) 0.74, 2.31      B) 0.74, 5.55      C) 0.74, 3.88      D) 0.74, 2.40

91) $\sin x = 0.29$

  A) 0.29, 3.44      B) 0.29, 5.99      C) 0.29, 1.87      D) 0.29, 2.85

91) _____

**Solve the triangle. Round lengths to the nearest tenth and angle measures to the nearest degree.**

92) $B = 46°$

  $C = 107°$

  $b = 31$

  A) $A = 25°$, $a = 41.2$, $c = 19.6$       B) $A = 27°$, $a = 19.6$, $c = 41.2$

  C) $A = 25°$, $a = 43.2$, $c = 21.6$       D) $A = 27°$, $a = 21.6$, $c = 43.2$

92) _____

**Two sides and an angle (SSA) of a triangle are given. Determine whether the given measurements produce one triangle, two triangles, or no triangle at all. Solve each triangle that results. Round lengths to the nearest tenth and angle measures to the nearest degree.**

93) $A = 30°$, $a = 7$, $b = 14$

  A) $B = 60°$, $C = 60°$, $c = 12.1$      B) no triangle

  C) $B = 90°$, $C = 60°$, $c = 12.1$      D) $B = 60°$, $C = 90°$, $c = 12.1$

93) _____

94) $B = 33°$, $b = 18$, $a = 35$

  A) $A = 31°$, $C = 115°$, $c = 53$       B) $A = 32°$, $C = 116°$, $c = 54.5$

  C) no triangle             D) $A = 29°$, $C = 117°$, $c = 50$

94) _____

95) $B = 28°$, $b = 4.9$, $a = 5.22$

  A) $A_1 = 30°$, $C_1 = 122°$, $c_1 = 8.9$;     B) $A = 150°$, $C = 2°$, $c = 0.4$

   $A_2 = 150°$, $C_2 = 2°$, $c_2 = 0.4$

  C) $A = 30°$, $C = 122°$, $c = 8.9$      D) no triangle

95) _____

**Find the area of the triangle having the given measurements. Round to the nearest square unit.**

96) $B = 15°$, $a = 4$ feet, $c = 9$ feet

  A) 17 square feet    B) 5 square feet    C) 9 square feet    D) 19 square feet

96) _____

**Solve the problem.**

97) A surveyor standing 59 meters from the base of a building measures the angle to the top of the building and finds it to be 35°. The surveyor then measures the angle to the top of the radio tower on the building and finds that it is 46°. How tall is the radio tower?

  A) 11.47 meters    B) 19.78 meters    C) 7.35 meters    D) 8.6 meters

97) _____

**Solve the triangle. Round lengths to the nearest tenth and angle measures to the nearest degree.**

98) $a = 7$, $b = 14$, $c = 15$

  A) $A = 28°$, $B = 70°$, $C = 82°$      B) $A = 26°$, $B = 70°$, $C = 84°$

  C) $A = 30°$, $B = 68°$, $C = 82°$      D) no triangle

98) _____

99) $b = 6$, $c = 10$, $A = 107°$

  A) $a = 18.9$, $B = 24°$, $C = 49°$      B) $a = 13.1$, $B = 26°$, $C = 47°$

  C) $a = 16$, $B = 28°$, $C = 45°$       D) no triangle

99) _____

**Solve the problem.**

100) Two airplanes leave an airport at the same time, one going northwest (bearing 135°) at 424 mph and the other going east at 337 mph. How far apart are the planes after 2 hours (to the nearest mile)?
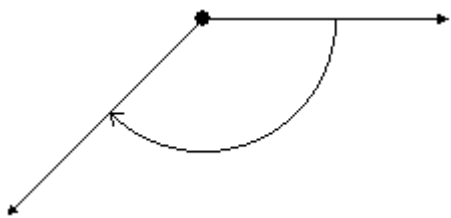
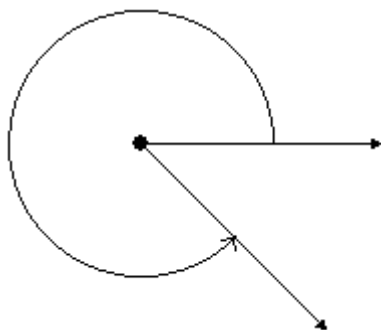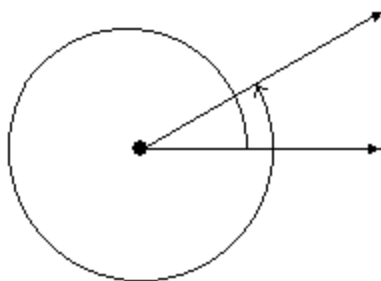    A) 704 miles          B) 1408 miles          C) 1173 miles          D) 1256 miles

100) _____

1) A
2) C
3) B
4) D
5) C
6) D
7) D
8)



9)



10)



11) D
12) A
13) B
14) D
15) B
16) B
17) C
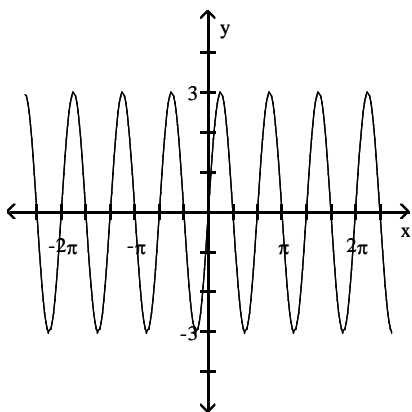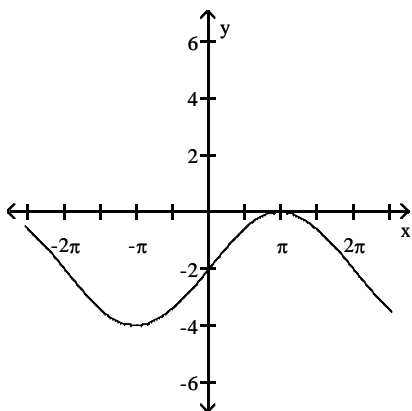18) C
19) A
20) C
21) D
22) $-\dfrac{3\sqrt{13}}{13}$
23) A

24) $\dfrac{\sqrt{97}}{4}$

25) $-\dfrac{3\sqrt{5}}{5}$

26) B
27) B
28) B
29) D
30)



31) C
32) A
33) B
34) A
35)



36) A
37) D
38) A
39) B
40) B
41) 1
42) $\sec^2 2x$
43) $\sin x$
44) B
45) D

46) $\csc^2 u - \cos u \sec u = \csc^2 u - \cos u \cdot \dfrac{1}{\cos u} = \csc^2 u - 1 = \cot^2 u$

47) $(1 + \tan^2 u)(1 - \sin^2 u) = \sec^2 u \cdot \cos^2 u = \dfrac{1}{\cos^2 u} \cdot \cos^2 u = 1$

48) $\csc u - \sin u = \dfrac{1}{\sin u} - \sin u = \dfrac{1 - \sin^2 u}{\sin u} = \dfrac{\cos^2 u}{\sin u} = \cos u \cdot \dfrac{\cos u}{\sin u} = \cos u \cot u$

49) $1 + \sec^2 x \sin^2 x = 1 + \dfrac{\sin^2 x}{\cos^2 x} = 1 + \tan^2 x = \sec^2 x.$

50) $\cot^2 x + \csc^2 x = \csc^2 x - 1 + \csc^2 x = 2 \csc^2 x - 1.$

51) C
52) B
53) C
54) D
55) B
56) A
57) D
58) C
59) C
60) A
61) C
62) C
63) B
64) C
65) D
66) A
67) A
68) B
69) A
70) B
71) A
72) B
73) C
74) D
75) D
76) B
77) A
78) D
79) C
80) D
81) A
82) C
83) B
84) B
85) B
86) C
87) B
88) C
89) B

90) B
91) D
92) B
93) C
94) C
95) A
96) B
97) B
98) A
99) B
100) B