Math 180 – chapter 6 and 7.1 – 7.3 Name_____

Find the value of the expression.

1) $\sin^{-1} 0.5$

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

3) $\cos^{-1} \left(-\frac{\sqrt{3}}{2}\right)$

4) $\sin^{-1} \frac{\sqrt{2}}{2}$

Find the exact value of the expression.

5) $\sin [\sin^{-1} (0.7)]$

6) $\cos^{-1} [\cos (-\frac{3\pi}{5})]$

7) $\tan [\tan^{-1} (0.7)]$

Use a calculator to find the value of the expression in radian measure rounded to 2 decimal places.

8) $\cos^{-1}\left(\frac{1}{6}\right)$

Find the exact value of the expression.

9) $\sin (\tan^{-1} 2)$

10) $\cos\left(\sin^{-1} \frac{3}{5}\right)$

11) $\tan [\cos^{-1} (-\frac{1}{3})]$

Establish the identity.

12) $\sin^2\theta + \tan^2\theta + \cos^2\theta = ?$

13) $\sec \theta - \frac{1}{\sec \theta} = ?$

Establish the identity.

14) $(1 + \cot \theta)(1 - \cot \theta) - \csc^2 \theta = -2 \cot^2 \theta$

15) $\frac{\cos\theta}{1+\sin\theta} + \tan\theta = \sec\theta$

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

16) $\sin\frac{\pi}{12}$

Use trigonometric identities to find the exact value.

17) $\sin 25^\circ \cos 35^\circ + \cos 25^\circ \sin 35^\circ$

18) $\frac{\tan 170^\circ - \tan 50^\circ}{1 + \tan 170^\circ \tan 50^\circ}$

Find the exact value of the expression under the given conditions.

19) $\sin\alpha = -\frac{7}{25},\ \frac{3\pi}{2} < \alpha < 2\pi; \quad \tan\beta = -\frac{5}{12},\ \frac{\pi}{2} < \beta < \pi$

Find $\cos(\alpha + \beta)$

Find the exact value of the trigonometric function.

20) $\sin\left(-\frac{11\pi}{12}\right)$

Find the exact value of the expression.

21) $\frac{1 - \tan 80^\circ \tan 70^\circ}{\tan 80^\circ + \tan 70^\circ}$

Establish the identity.

22) $\cos(\alpha + \beta)\cos(\alpha - \beta) = ?$

23) $\cos\left(\frac{\pi}{2} + \theta\right) = ?$

Find the exact value of the expression under the given conditions.

24) $\sin\theta = \frac{20}{29},\ 0 < \theta < \frac{\pi}{2}$

Find $\cos(2\theta)$.

Find the exact value of the expression.

25) $\cos\left(\tan^{-1}\frac{4}{3} - \sin^{-1}\frac{3}{5}\right)$

Find the exact value of the expression under the given conditions.

26) $\csc\theta = -\frac{4}{3},\ \tan\theta > 0$

Find $\cos(2\theta)$.

Establish the identity.

27) $\dfrac{\sin(2\theta)+2\sin^2\theta}{\cos(2\theta)} = \dfrac{2\tan\theta}{1-\tan\theta}$

Find the exact value of the expression under the given conditions.

28) Find $\sin\left(\dfrac{\theta}{2}\right)$, given that $\sec\theta = -\dfrac{17}{15}$ and $\dfrac{\pi}{2} < \theta < \pi$.

Find the exact value by using trig identities.

29) $\tan 75^\circ$

Using the information given, find the exact value of the trigonometric function.

30) Find $\cos\dfrac{\theta}{2}$, given that $\sin\theta = -\dfrac{1}{4}$, and $\dfrac{3\pi}{2} < \theta < 2\pi$.

Solve the equation for solutions in the interval $0 \le \theta < 2\pi$.

31) $\sqrt{2}\cos 2\theta = 1$

32) $\sin 4\theta = \dfrac{\sqrt{3}}{2}$

Use a calculator to solve the equation on the interval $0 \le \theta < 2\pi$. Round the answer to two decimal places.

33) $\tan\theta = 3.7$

Solve the equation. Give a general formula for all the solutions.

34) $\csc\dfrac{\theta}{3} = \dfrac{2\sqrt{3}}{3}$

Solve the equation on the interval $0 \le \theta < 2\pi$.

35) $\cot\left(2\theta - \dfrac{\pi}{2}\right) = 1$

Using a graphing utility, solve the equation on the interval $0 \le \theta < 2\pi$. Round answer to three decimal places.

36) $2\csc\theta = 5$

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

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

38) $2\sin^2 x = \sin x$

Solve the equation for solutions in the interval $0 \le \theta < 2\pi$.

39) $\sec \frac{x}{2} = \cos \frac{x}{2}$

40) $\sin^2 2x = 1$

41) $\tan 2x - \tan x = 0$

42) $\cos 2x = \sqrt{2} - \cos 2x$

Solve the equation on the interval $0 \le \theta < 2\pi$.

43) $\cos \theta - \sin \theta = 0$

Solve the problem.

44) The path of a projectile fired at an inclination θ (in degrees) to the horizontal with an initial velocity v_0 is a parabola. The range R of the projectile, that is, the horizontal distance that the projectile travels, is found by using the formula

$$R = \frac{v_0^2}{g} \sin 2\theta$$

where g is the acceleration due to gravity. Suppose the projectile is fired with an initial velocity of 400 feet per seconds and $g = 32$ feet per second^2. What angle θ, $0^\circ \le \theta < 90^\circ$, would you select for the range to be 2500 feet? (There should be two values of θ.)

Two sides of a right triangle ABC (C is the right angle) are given. Find the indicated trigonometric function of the given angle. Give exact answers with rational denominators.

45) Find sin A when $a = 7$ and $b = 6$.

Find the exact value of the expression. Do not use a calculator.

46) $\tan 75^\circ - \frac{\cos 15^\circ}{\cos 75^\circ}$

Solve the right triangle using the information given. Assume side c is the hypotenuse, and that sides a and b are opposite to angles α and β respectively. Round answers to two decimal places, if necessary.

47) $a = 4$, $\beta = 20^\circ$. Find b, c, and α.

Solve the problem.

48) A surveyor is measuring the distance across a small lake. He has set up his transit on one side of the lake 120 feet from a piling that is directly across from a pier on the other side of the lake. From his transit, the angle between the piling and the pier is 70°. What is the distance between the piling and the pier to the nearest foot?

49) A building 270 feet tall casts a 90 foot long shadow. If a person stands at the end of the shadow and looks up to the top of the building, what is the angle of the person's eyes to the top of the building (to the nearest hundredth of a degree)? (Assume the person's eyes are 6 feet above ground level.)

Find the missing parts of the triangle.

50) $\beta = 83.5^\circ$
$b = 12.45$
$a = 23.5$

51) $\beta = 11.6^\circ$
$b = 5.69$
$a = 9.43$

Solve the problem.

52) An airplane is sighted at the same time by two ground observers who are 2 miles apart and in line with the airplane. They report the angles of elevation as 10° and 22°. How high is the airplane?

53) Two surveyors 180 meters apart on the same side of a river measure their respective angles to a point on the other side of the river and obtain 54° and 68°. How far from the point (line–of–sight distance) is each surveyor? Round your answer to the nearest 0.1 meter.

Find the missing parts of the triangle.

54) $\gamma = 125.1^\circ$
$a = 6.90$
$b = 11.24$

Find the missing parts of the triangle. (Find angles to the nearest hundredth of a degree.)

55) $a = 7.1$
$b = 13.7$
$c = 16.5$

Solve the problem.

56) In flying the 84 miles from Champaign to Peoria, a student pilot sets a heading that is 12° off course and maintains an average speed of 136 miles per hour. After 15 minutes, the instructor notices the course error and tells the student to correct his heading. Through what angle will the plane move to correct the heading and how many miles away is Peoria when the plane turns?

57) Two points A and B are on opposite sides of a building. A surveyor selects a third point C to place a transit. Point C is 46 feet from point A and 65 feet from point B. The angle ACB is 53°. How far apart are points A and B?

58) The distance from home plate to dead center field in Sun Devil Stadium is 404 feet. A baseball diamond is a square with a distance from home plate to first base of 90 feet. How far is it from first base to dead center field?

59) A hill slopes at an angle of 15° with the horizontal. From the base of the hill, the angle of elevation of a 600 ft tower at the top of the hill is 40°. How much rope would be required to reach from the top of the tower to the bottom of the hill? Round answer to the nearest foot.

1) $\frac{\pi}{6}$
2) $-\frac{\pi}{4}$
3) $\frac{5\pi}{6}$
4) $\frac{\pi}{4}$
5) 0.7
6) $\frac{3\pi}{5}$
7) 0.7
8) 1.40
9) $\frac{2\sqrt{5}}{5}$
10) $\frac{4}{5}$
11) $-2\sqrt{2}$
12) $\sec^2\theta$
13) $\sin\theta\tan\theta$
14) $-2\cot^2\theta$
15) $\sec\theta$
16) $\frac{\sqrt{2}(\sqrt{3}-1)}{4}$
17) $\frac{\sqrt{3}}{2}$
18) $-\sqrt{3}$
19) $-\frac{253}{325}$
20) $\frac{\sqrt{2}-\sqrt{6}}{4}$
21) $-\sqrt{3}$
22) $\cos^2\beta-\sin^2\alpha$
23) $-\sin\theta$
24) $\frac{41}{841}$
25) $\frac{24}{25}$
26) $-\frac{1}{8}$
27) $\frac{2\tan\theta}{1-\tan\theta}$
28) $\frac{4\sqrt{17}}{17}$

29) $2 + \sqrt{3}$

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

31) $\frac{\pi}{8}, \frac{7\pi}{8}, \frac{9\pi}{8}, \frac{15\pi}{8}$

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

33) 1.31, 4.45

34) $\theta = \pi + 6k\pi$

35) $\theta = \frac{3\pi}{8}, \frac{7\pi}{8}, \frac{11\pi}{8}$, and $\frac{15\pi}{8}$

36) $\theta = 0.412$, 2.730

37) $x = \pi$

38) $x = 0, \pi, \frac{\pi}{6}, \frac{5\pi}{6}$

39) $x = 0$

40) $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

41) $x = 0, \pi$

42) $x = \frac{\pi}{8}, \frac{7\pi}{8}, \frac{9\pi}{8}, \frac{15\pi}{8}$

43) $\frac{\pi}{4}, \frac{5\pi}{4}$

44) 15°, 75°

45) $\frac{7\sqrt{85}}{85}$

46) 0

47) $\alpha = 70^\circ$, b = 1.46, c = 4.26

48) 330 feet

49) 71.18°

50) No solution

51) $\alpha = 19.47^\circ$, $\gamma = 148.93^\circ$, c = 14.6;
$\alpha' = 160.53^\circ$, $\gamma' = 7.87^\circ$, c' = 3.87

52) 0.63 miles

53) 196.8 m, 171.7 m

54) c = 16.2, $\alpha = 20.4^\circ$, $\beta = 34.5^\circ$

55) $\alpha = 25.06^\circ$, $\beta = 54.82^\circ$, $\gamma = 100.12^\circ$

56) 19.9°; 51.23 miles

57) 52.4 feet

58) 346.3 feet

59) 1371 ft