

Find the center (h, k) and radius r of the circle. Graph the circle.

1) Find the center, radius, and graph of $x^2 + y^2 - 4x + 8y + 11 = 0$. 1) _____

Use a graphing utility to approximate the real solutions, if any, of the equation rounded to two decimal places.

2) $x^4 - 3x^2 + 4x + 15 = 0$ 2) _____

Solve the equation.

3) $1 - \frac{9}{5x} = \frac{7}{3}$ 3) _____

4) $4x^3 - 8x^2 = 12x$ 4) _____

5) $3n^2 = -12n - 5$ 5) _____

6) $\sqrt{p^2 - 5p + 4} = p - 3$ 6) _____

7) $(x^2 - 5)^{1/2} = 11$ 7) _____

Solve the problem.

8) Find the value of $\frac{f(x+h) - f(x)}{h}$, $h \neq 0$ for the function $f(x) = 4x^2 + 5x$. 8) _____

Give the domain of the function.

9) $f(x) = \frac{\sqrt{x+7}}{(x+5)(x+7)}$ 9) _____

10) $f(x) = \sqrt{14-x}$ 10) _____

Find the average rate of change for the function over the given interval.

11) $f(x) = x^2 + 1x$ between $x = 6$ and $x = 8$ 11) _____

Determine if the given function is even, odd, or neither.

12) $f(x) = x^3 - 4x$ 12) _____

Find the requested function.

13) Let $f(x) = 16 - x^2$, $g(x) = 4 - x$. Find $(f + g)(x)$. 13) _____

Find the indicated composite for the pair of functions.

14) $(g \circ f)(x)$: $f(x) = 4x^2 + 5x + 3$, $g(x) = 5x - 5$ 14) _____

Solve the problem.

15) An open box with a square base is required to have a volume of 27 cubic feet. Express the amount A of material used to make such a box as a function of the length x of a side of the base. 15) _____

Find the vertex and axis of symmetry of the graph of the function.

16) $f(x) = 4x^2 + 24x - 1$ 16) _____

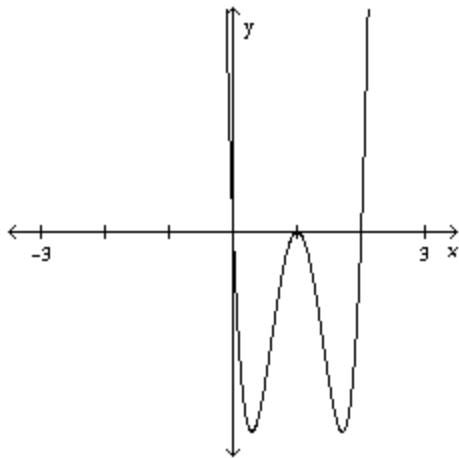
Solve the problem.

- 17) The owner of a video store has determined that the cost C , in dollars, of operating the store is approximately given by $C = 2x^2 - 32x + 750$, where x is the number of videos rented daily. Find the lowest cost to the nearest dollar. 17) _____

Answer the question.

- 18) For the polynomial $f(x) = (x - 2)^3(x - 3)^2(x - 4)$ 18) _____
- (a) Find the x - and y -intercepts of the graph of f .
 - (b) Determine whether the graph crosses or touches the x -axis at each x -intercept.
 - (c) End behavior: find the power function that the graph of f resembles for large values of $|x|$.
 - (d) Use a graphing utility to graph the function. Determine the number of turning points on the graph.
 - (e) Approximate the local minima rounded to two decimal places.
 - (f) Put all the information together, and connect the points with a smooth, continuous curve to obtain the graph of f .

- 19) Which of the following polynomial functions might have the graph shown in the illustration below? 19) _____



- A) $f(x) = x^2(x - 2)(x - 1)$
- B) $f(x) = x^2(x - 2)^2(x - 1)^2$
- C) $f(x) = x(x - 2)^2(x - 1)$
- D) $f(x) = x(x - 2)(x - 1)^2$

Construct a polynomial with the given properties.

- 20) The graph of the polynomial crosses the x -axis at -2 and 3 , touches the x -axis at 5 , crosses the y -axis at -5 and is below the x -axis between -2 and 3 . 20) _____

Give the equation of the specified asymptote(s).

- 21) Vertical asymptote(s): $f(x) = \frac{x - 8}{x^2 - 16}$ 21) _____

- 22) Horizontal asymptote: $h(x) = \frac{8x^2 - 9x - 7}{5x^2 - 8x + 9}$ 22) _____

- 23) Oblique asymptote: $f(x) = \frac{x^2 + 2x - 2}{x - 8}$ 23) _____

Construct a rational expression with the given characteristics.

- 24) The graph of $R(x)$ crosses the x -axis at -1 , touches the x -axis at -4 , has vertical asymptotes at $x = -2$ and $x = 3$, and has one horizontal asymptote at $y = -2$. 24) _____

Solve the problem.

- 25) A rare species of insect was discovered in the rain forest of Costa Rica. Environmentalists transplant the insect into a protected area. The population of the insect t months after being transplanted is 25) _____

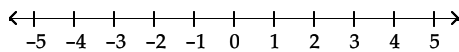
$$P(t) = \frac{45(1 + 0.6t)}{(3 + 0.02t)}$$

- (a) What was the population when $t = 0$?
(b) What will the population be after 10 years?
(c) What is the largest value the population could reach?

Solve the inequality.

- 26) $(b + 6)(b + 1)(b - 1) < 0$ 26) _____

- 27) $\frac{(x - 1)(3 - x)}{(x - 2)^2} \leq 0$ 27) _____



Find all real zeros of the given polynomial function P , and use the real zeros to factor P .

- 28) $P(x) = 2x^3 + 3x^2 - 9x - 10$ 28) _____

Find the real solutions of the equation.

- 29) $2x^3 - x^2 - 20x + 10 = 0$ 29) _____

Information is given about a complex polynomial $f(x)$ whose coefficients are real numbers. Find the remaining zeros of f .

- 30) Degree 6; zeros: $-2, 2 + i, -3 - i, 0$ 30) _____

Form a polynomial $f(x)$ with real coefficients having the given degree and zeros.

- 31) Find a third-degree polynomial function with real coefficients and with zeros -2 and $3 + i$. 31) _____

Find the complex zeros of the polynomial function.

- 32) $f(x) = x^4 - 8x^3 + 16x^2 + 8x - 17$. 32) _____

The function f is one-to-one. Find its inverse.

- 33) Determine the equation for the inverse function of $y = (x + 2)^3 - 8$. 33) _____

Solve the equation.

- 34) $2(x^2 - 3) = 64$ 34) _____

Convert to logarithmic form.

- 35) $e^x = 15$ 35) _____

Find the value of the expression.

36) $\log_9 \frac{1}{81}$ 36) _____

Find the domain of the function.

37) $f(x) = \log(x - 9)$ 37) _____

Solve the problem.

38) $\log_5 x = 3$ 38) _____

39) The formula $D = 6e^{-0.04h}$ can be used to find the number of milligrams D of a certain drug in a patient's bloodstream h hours after the drug has been given. When the number of milligrams reaches 4, the drug is to be given again. What is the time between injections? 39) _____

Solve the equation.

40) $\log 4x = \log 2 + \log(x - 1)$ 40) _____

Solve the given logarithmic equation.

41) $\log_2(3x - 2) - \log_2(x - 5) = 4$ 41) _____

Solve the problem.

42) During 1991, 200,000 people visited Rave Amusement Park. During 1997, the number had grown to 834,000. If the number of visitors to the park obeys the law of uninhibited growth, find the exponential growth function that models this data. 42) _____

43) A fossilized leaf contains 14% of its normal amount of carbon 14. How old is the fossil (to the nearest year)? Use 5600 years as the half-life of carbon 14. 43) _____

44) A thermometer reading 79°F is placed inside a cold storage room with a constant temperature of 35°F. If the thermometer reads 74°F in 13 minutes, how long before it reaches 57°F? Assume the cooling follows Newton's Law of Cooling:
 $U = T + (U_0 - T)e^{kt}$.
(Round your answer to the nearest whole minute.) 44) _____

45) The logistic growth model $P(t) = \frac{180}{1 + 44e^{-0.188t}}$ represents the population of a species introduced into a new territory after t years. When will the population be 80? 45) _____

In the problem, t is a real number and $P=(x,y)$ is the point on the unit circle that corresponds to t . Find the exact value of the given trigonometric function.

46) $\left(-\frac{\sqrt{33}}{7}, \frac{4}{7}\right)$; find $\cos t$ 46) _____

Solve the problem.

47) Find the exact value of $\tan \frac{7\pi}{4} + \tan \frac{5\pi}{4}$. Do not use a calculator. 47) _____

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

48) $\cot 930^\circ$ 48) _____

Solve the problem.

49) Find the exact value of $\sin 135^\circ - \sin 270^\circ$. Do not use a calculator. 49) _____

Use the fact that the trigonometric functions are periodic to find the exact value of the expression.

50) $\cos \frac{10\pi}{3}$ 50) _____

51) $\cos \frac{20\pi}{3}$ 51) _____

Use the given values of the sine and cosine to find the function value.

52) $\sin \theta = -\frac{\sqrt{7}}{4}$, $\cos \theta = \frac{3}{4}$. Find $\cot \theta$. 52) _____

Find the exact value of the expression.

53) $\sec^2 65^\circ - \tan^2 65^\circ$ 53) _____

Find the exact value of the requested trigonometric function of θ .

54) $\csc \theta = -\frac{7}{4}$ and θ in quadrant III 54) _____

Find $\cot \theta$.

Use the even-odd properties to find the exact value of the expression.

55) $\tan\left(-\frac{\pi}{3}\right)$ 55) _____

Give the amplitude or period as requested.

56) Period of $y = \sin 5x$ 56) _____

Write the equation of a sine function with the given characteristics.

57) Amplitude: 4
Period: 3 57) _____

Solve.

58) For what numbers x , $0 \leq x \leq 2\pi$, does $\cos x = 0$? 58) _____

59) For what numbers x , $-2\pi \leq x \leq 2\pi$, does the graph of $y = \sec x$ have vertical asymptotes.? 59) _____

Find the phase shift of the function.

60) $y = 2 \sin\left(\frac{1}{2}x - \frac{\pi}{2}\right)$ 60) _____

Graph the function. Show at least one period.

61) $y = 2\cos\left(3x + \frac{\pi}{2}\right)$ 61) _____

Write the equation of a sine function with the given characteristics.

- 62) Amplitude: 2
Period: π
Phase Shift: $\frac{3}{2}$

62) _____

Find the value of the expression.

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

63) _____

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

64) _____

Find the exact value of the expression.

65) $\cos^{-1}\left(\cos \frac{7\pi}{6}\right)$

65) _____

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

66) _____

67) $\sec^{-1} (2)$

67) _____

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

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

68) _____

Use trigonometric identities to find the exact value.

69) $\cos\left(\frac{5\pi}{12}\right)\cos\left(\frac{\pi}{4}\right) + \sin\left(\frac{5\pi}{12}\right)\sin\left(\frac{\pi}{4}\right)$

69) _____

Find the exact value of the expression.

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

70) _____

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

71) $\sin \alpha = -\frac{4}{5}, \frac{3\pi}{2} < \alpha < 2\pi; \tan \beta = -\frac{24}{7}, \frac{\pi}{2} < \beta < \pi$

71) _____

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

Complete the identity.

72) $\sin(\alpha + \beta) \cos \beta - \cos(\alpha + \beta) \sin \beta$

72) _____

Find the exact value of the expression.

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

73) _____

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

74) $\sec \theta = -\frac{5\sqrt{21}}{21}, \csc \theta > 0$

74) _____

Find $\sin(2\theta)$.

Find the exact value by using a half-angle identity.

75) $\tan 75^\circ$ 75) _____

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

76) $\sqrt{2} \cos 2\theta = 1$ 76) _____

77) $\sin^2 x - \cos^2 x = 0$ 77) _____

78) $6 \cos^2 \theta - 7 \cos \theta - 3 = 0$ 78) _____

79) $\cos 2x = \sqrt{2} - \cos 2x$ 79) _____

Find the missing parts of the triangle.

80) $\alpha = 44^\circ 30'$
 $\beta = 24^\circ 10'$
 $a = 16.30$ 80) _____

81) $\beta = 11.6^\circ$
 $b = 5.69$
 $a = 9.43$ 81) _____

82) $\gamma = 125.1^\circ$
 $a = 6.90$
 $b = 11.24$ 82) _____

Solve the problem.

83) 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. 83) _____

84) A straight trail with a uniform inclination of 15° leads from a lodge at an elevation of 1000 feet to a mountain lake at an elevation of 7800 feet. What is the length of the trail (to the nearest foot)? 84) _____

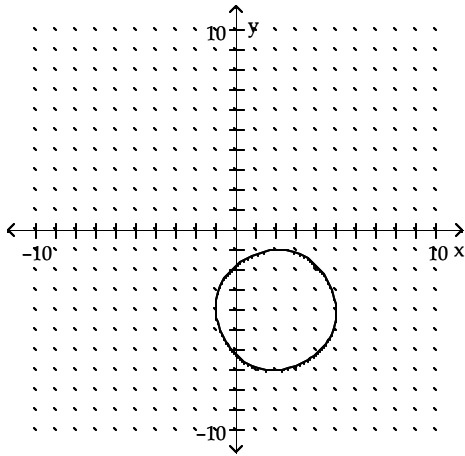
85) In flying the 84 miles from Champaign to Peoria, a student pilot sets a heading that is 12° off course and maintains an average speed of 136 miles per hour. After 15 minutes, the instructor notices the course error and tells the student to correct his heading. Through what angle will the plane move to correct the heading and how many miles away is Peoria when the plane turns? 85) _____

86) 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? 86) _____

Answer Key

Testname: FINREV

1) center $(2, -4)$; $r = 3$



2) no solution

3) $\{-\frac{27}{20}\}$

4) $\{-1, 0, 3\}$

5) $\left\{\frac{-6 \pm \sqrt{21}}{3}\right\}$

6) $\{5\}$

7) $x = 3\sqrt{14}$, $x = -3\sqrt{14}$

8) $8x + 4h + 5$

9) $x \geq -7$, $x \neq -5$, $x \neq -7$

10) $x \leq 14$

11) 15

12) Odd

13) $-x^2 - x + 20$

14) $20x^2 + 25x + 10$

15) $A = x^2 + \frac{108}{x}$

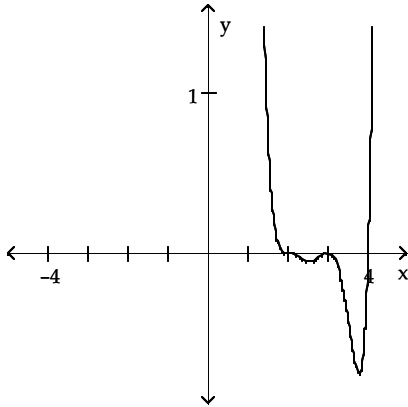
16) $(-3, -37)$; $x = -3$

17) \$622

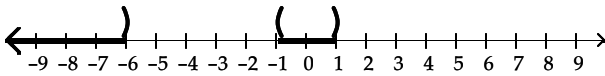
Answer Key

Testname: FINREV

- 18) (a) The x -intercepts are 2, 3, and 4.
 The y -intercept is 288.
 (b) The graph crosses the x -axis at 2 and 4, and touches it at 3.
 (c) The graph resembles $f(x) = x^6$ for large values of $|x|$.
 (d) The graph has 3 turning points.
 (e) (2.57, -0.05), (3.77, -0.76)
 (f)



- 19) D
 20) $P(x) = (x + 2)(x - 3)(x - 5)^2$
 21) $x = 4, x = -4$
 22) $y = \frac{8}{5}$
 23) $y = x + 10$
 24) $R(x) = \frac{-2(x + 1)(x + 4)^2}{(x + 2)^2(x - 3)}, x \neq -2, 3$
 25) (a) $P(0) = 15$ insects
 (b) $P(120) \approx 608$ insects
 (c) 1,350
 26) $(-\infty, -6)$ or $(-1, 1)$



- 27) $(-\infty, 1]$ or $[3, \infty)$
 28) real zeros of P : $-\frac{5}{2}, -1, 2$; $P(x) = (2x + 5)(x + 1)(x - 2)$

29) $\{\frac{1}{2}, \sqrt{10}, -\sqrt{10}\}$

30) $2 - i, -3 + i$

31) $f(x) = z^3 - 4z^2 - 2z + 20$

32) $1, -1, 4 - i, 4 + i$

33) $y = \sqrt[3]{x + 8} - 2$

34) $x = 3$ or $x = -3$

35) $\ln 15 = x$

36) -2

37) $x > 9$

38) $\{125\}$

Answer Key

Testname: FINREV

39) 10.14 hrs

40) $\{-1\}$

41) $x = 6$

42) $f(t) = 200,000e^{0.238t}$

43) 15,856

44) 75 minutes

45) 18.94 years

46) $-\frac{\sqrt{33}}{7}$

47) 0

48) $\sqrt{3}$

49) $\frac{\sqrt{2} + 2}{2}$

50) $-\frac{1}{2}$

51) $-\frac{1}{2}$

52) $\frac{-3\sqrt{7}}{7}$

53) 1

54) $\frac{\sqrt{33}}{4}$

55) $-\sqrt{3}$

56) $\frac{2\pi}{5}$

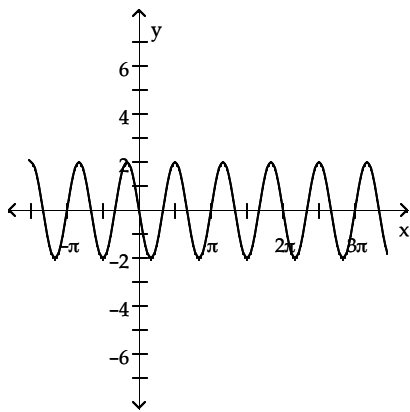
57) $y = 4 \sin\left(\frac{2}{3}\pi x\right)$

58) $\frac{\pi}{2}, \frac{3\pi}{2}$

59) $-\frac{3\pi}{2}, -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}$

60) π units to the right

61)



62) $y = 2 \sin(2x - 3)$

Answer Key

Testname: FINREV

63) $-\frac{\pi}{6}$

64) $\frac{3\pi}{4}$

65) $\frac{5\pi}{6}$

66) $\frac{3}{5}$

67) $\frac{\pi}{3}$

68) $\frac{\sqrt{2}(\sqrt{3}-1)}{4}$

69) $\frac{\sqrt{3}}{2}$

70) $-\sqrt{3}$

71) $\frac{3}{5}$

72) $\sin \alpha$

73) $\frac{24}{25}$

74) $\frac{-4\sqrt{21}}{25}$

75) $2 + \sqrt{3}$

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

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

78) $\theta = 1.91, 4.37$

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

80) $\gamma = 111^\circ 20'$, $b = 9.52$, $c = 21.66$

81) $\alpha = 19.47^\circ$, $\gamma = 148.93^\circ$, $c = 14.6$;

$\alpha' = 160.53^\circ$, $\gamma' = 7.87^\circ$, $c' = 3.87$

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

83) 196.8 m, 171.7 m

84) 26,273 feet

85) 19.9° ; 51.23 miles

86) 346.3 feet