

Math

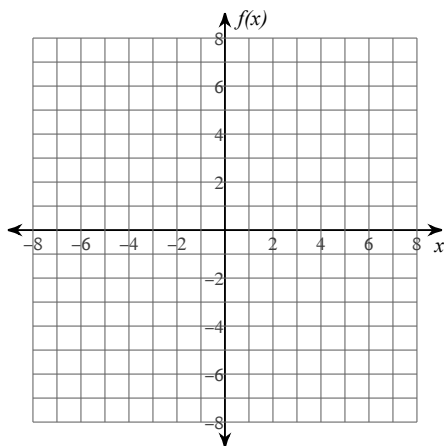
Determine if each function is continuous at the given x -values. If not continuous, classify each discontinuity.

1) $f(x) = -\frac{x}{x^2 + 2x + 2};$ at $x = 2$

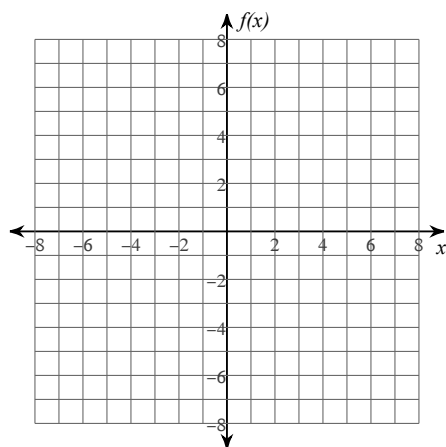
2) $f(x) = \begin{cases} x^2 - 4x + 3, & x \neq 1 \\ 0, & x = 1 \end{cases};$ at $x = 2$

Consider each power function. Determine the domain and range, intercepts, end behavior, continuity, and regions of increase and decrease. Then sketch the graph.

3) $f(x) = \frac{1}{3}x^6$



4) $f(x) = x^2$



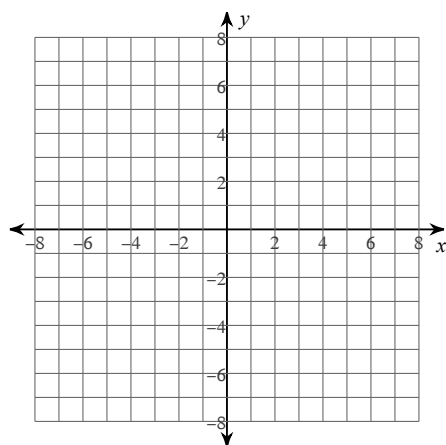
For each problem, find the average rate of change of the function over the given interval.

5) $f(x) = x^2 + 1$; $[0, 2]$

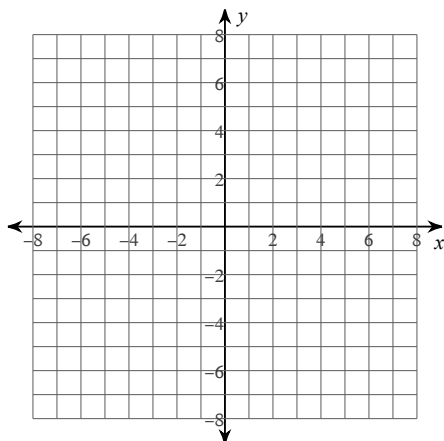
6) $f(x) = x^2 + 1$; $[-2, 0]$

Sketch the graph of each function.

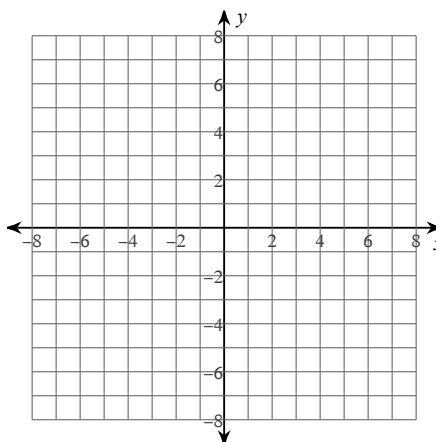
7) $g(x) = \begin{cases} |x + 1|, & x < -1 \\ -2 + \sqrt{x}, & x \geq -1 \end{cases}$



$$8) f(x) = \begin{cases} (x+5)^3, & x \leq -4 \\ x+2, & -4 < x \leq 2 \\ 0, & x > 2 \end{cases}$$



$$9) g(x) = \begin{cases} -|x|, & x < 1 \\ -\frac{1}{x}, & x \geq 1 \end{cases}$$



Describe the transformations necessary to transform the graph of $f(x)$ into that of $g(x)$.

$$10) f(x) = \frac{1}{x}$$

$$g(x) = -\frac{1}{x} + 2$$

$$11) f(x) = \frac{1}{x}$$

$$g(x) = \frac{1}{3x} - 3$$

Find the inverse of each function.

$$12) g(x) = \frac{3x}{4}$$

$$13) g(n) = 2(n-3)^3$$

$$14) \ h(n) = -\frac{5}{6}n + \frac{1}{3}$$

$$15) \ g(x) = \frac{3}{x+3} - 1$$

Perform the indicated operation.

$$16) \ f(n) = 3n + 1$$

$$g(n) = -3n^2 + 3$$

$$\text{Find } (2f + 3g)(n)$$

$$17) \ f(a) = 2a - 2$$

$$g(a) = -2a + 4$$

$$\text{Find } (f - g)(a)$$

$$18) \ g(x) = 3x - 4$$

$$f(x) = -x^3 + 5x$$

$$\text{Find } \left(\frac{g}{f}\right)(x)$$

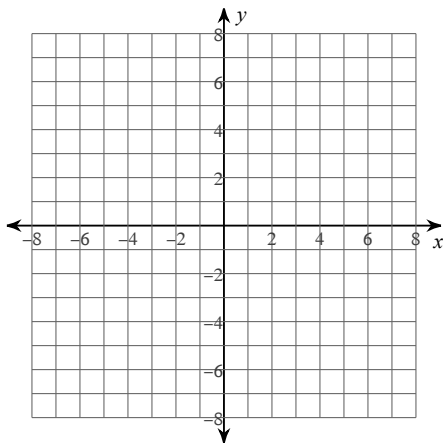
$$19) \ g(a) = 4a - 4$$

$$f(a) = a^3 + 5a$$

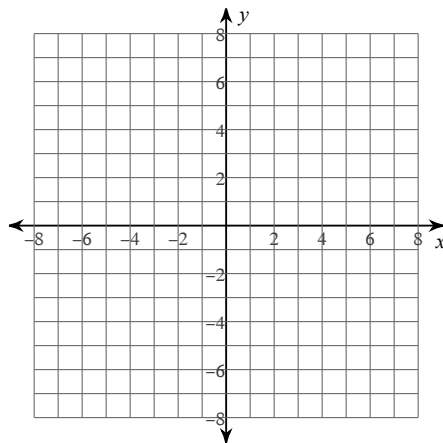
$$\text{Find } (g \circ f)(a)$$

Sketch the graph of each function.

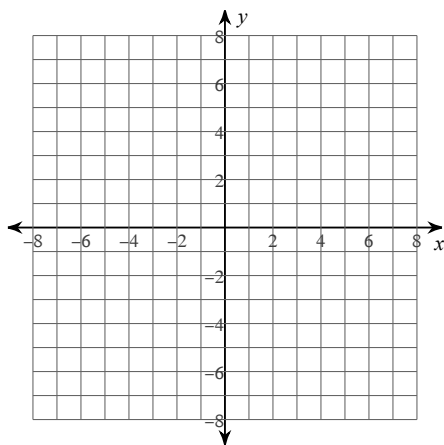
$$20) \ f(x) = -x^4 + 4x^2 + x - 4$$



$$21) \ f(x) = -x^4 + 4x^2 + 3x - 4$$



22) $f(x) = -x^4 + 4x^2 + 3x - 1$



Divide. Write your answer in fraction form.

23) $(9x^4 + 12x^3 + 21x^2 + 30x + 5) \div (3x + 1)$

24) $(5x^2 + 23x + 18) \div (x + 3)$

25) $(9x^2 + 24x + 20) \div (3x + 6)$

26) $(x^5 - 4x^4 - 9x^3 + 16x^2 - 2x + 4) \div (x - 1)$

27) $(5x^2 + 29x + 30) \div (x + 4)$

Find the remainder when $f(x)$ is divided by $x - k$.

28) $f(x) = 3x^4 + 3x - 2$
 $k = -1$

29) $f(x) = x^4 - 7x^3 + 14x^2 - 8x$
 $k = 3$

30) $f(x) = 5x^4 - 9x^3 + 8x^2 - 18x - 4$
 $k = 1$

Write a polynomial function of least degree with integral coefficients that has the given zeros.

31) $-5, 3, -3, -\frac{1}{3}$

32) $-2, 0, 3$

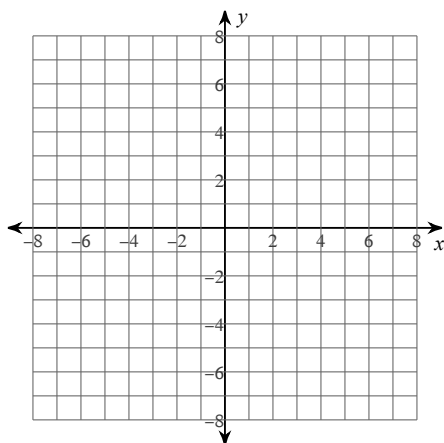
Find all zeros.

33) $f(x) = 5x^4 + 39x^2 - 8$

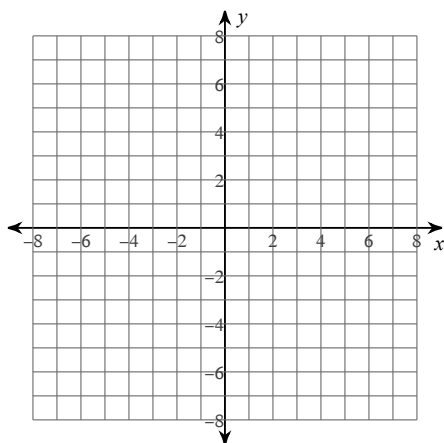
34) $f(x) = 2x^3 + 3x^2 - 1$

For each function, identify the holes, intercepts, and horizontal asymptote. Then sketch the graph.

$$35) f(x) = \frac{x^3 + 5x^2 + 6x}{-4x^2 + 4x}$$



$$36) f(x) = \frac{x^2 + x - 6}{4x^2 - 4x - 24}$$



Solve each equation. Remember to check for extraneous solutions.

$$37) \frac{1}{2k} + \frac{k-2}{k} = \frac{1}{4k}$$

$$38) \frac{n-1}{5n^2} = \frac{1}{n} - \frac{3}{n^2}$$

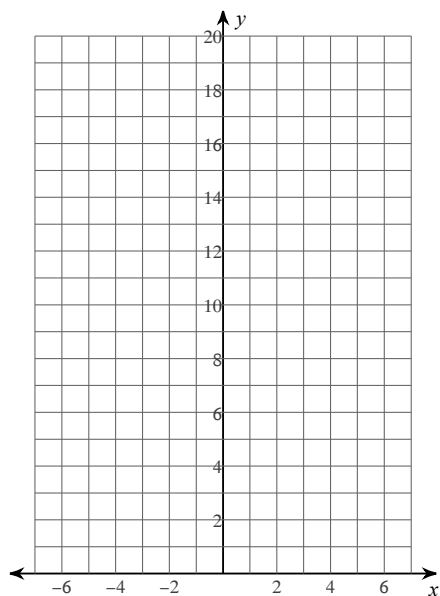
Solve each inequality.

$$39) \frac{3x+15}{4x-24} > -2$$

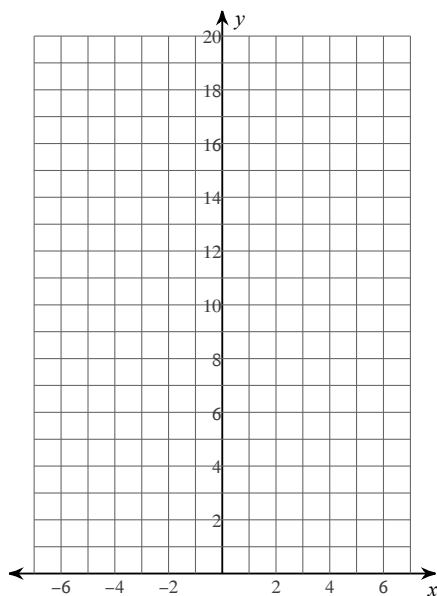
$$40) \frac{3x-25}{4x-4} \leq -2$$

Sketch the graph of each function.

$$41) y = \frac{1}{2} \cdot 3^x$$



$$42) y = \frac{1}{2} \cdot 6^x$$



Rewrite each equation in exponential form.

43) $\log_6 216 = 3$

44) $\log_{15} 225 = 2$

45) $\log_5 625 = 4$

Evaluate each expression.

46) $\log_4 64$

47) $\log_5 125$

Find the inverse of each function.

48) $y = -6\log_4 x$

49) $y = \log x^4$

Expand each logarithm.

50) $\log_3 \frac{x^3}{y^3}$

51) $\log_7 (w\sqrt[3]{u \cdot v})$

$$52) \log_9 (u \cdot v \cdot w^3)$$

Solve each equation. Round your answers to the nearest ten-thousandth.

$$53) -9 \cdot 16^{a-6} = -69$$

$$54) 16^{n+10} - 8 = 23$$

Solve each equation.

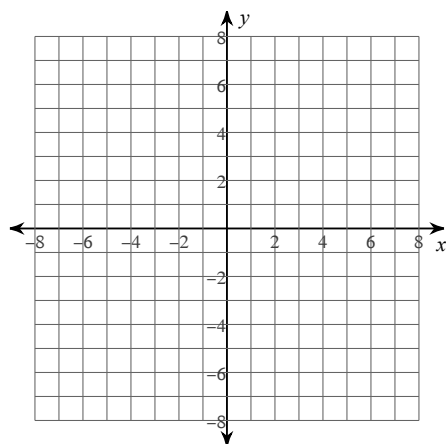
$$55) \log_6 14 = \log_6 (2n - 10)$$

$$56) \log (4 - 2a) = \log (-a - 2)$$

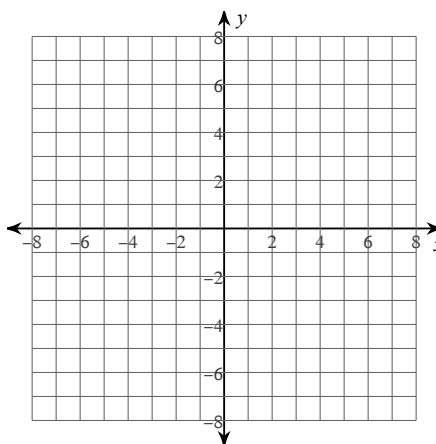
$$57) \log 16 = \log (3v + 10)$$

Identify the domain and range of each. Then sketch the graph.

58) $y = \log_6 (x - 1) + 1$



59) $y = \log_4 (x - 1) - 4$



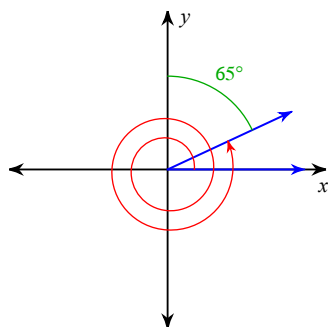
60) Trevon invests \$4,803 in a retirement account with a fixed annual interest rate of 2% compounded continuously. What will the account balance be after 15 years?

61) Mei invests \$4,223 in a retirement account with a fixed annual interest rate of 9% compounded continuously. What will the account balance be after 19 years?

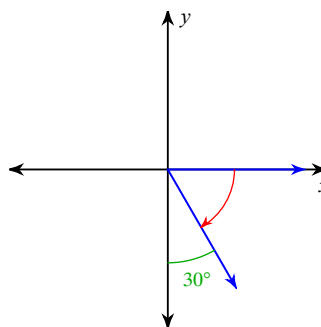
62) Trevon invests \$6,975 in a savings account with a fixed annual interest rate of 4% compounded continuously. What will the account balance be after 4 years?

Find the measure of each angle.

63)



64)



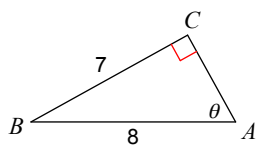
Convert each degree measure into radians and each radian measure into degrees.

65) $-\frac{143\pi}{36}$

66) $-\frac{15\pi}{4}$

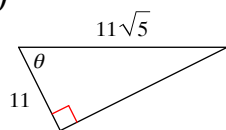
Find the measure of each angle indicated. Round to the nearest tenth.

67)



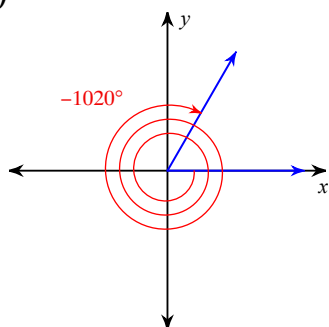
Find the value of the trig function indicated.

68) $\csc \theta$



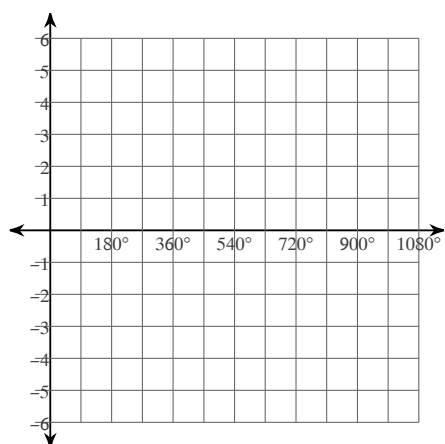
Find the exact value of each trigonometric function.

69) $\sec \theta$



Graph each function using degrees.

70) $y = \frac{1}{2} \cdot \sin\left(\frac{\theta}{2} - 90\right)$



Solve each equation for $0 \leq \theta < 360$.

71) $3\sqrt{3} = 9\tan \theta$

Find the exact value of each expression.

72) $\tan \cos^{-1} \frac{\sqrt{182}}{14}$

Use identities to find the value of each expression.

73) Find $\sec \theta$ and $\sin \theta$

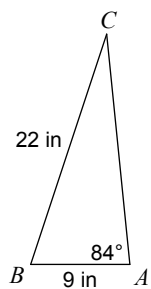
if $\tan \theta = \frac{4}{3}$ and $\csc \theta > 0$.

Solve each equation for $0 \leq \theta < 2\pi$.

74) $-3 = -2 - \cos \theta - 2\cos^2 \theta$

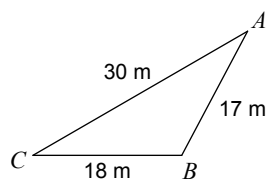
Find each measurement indicated. Round your answers to the nearest tenth.

75) Find $m\angle C$



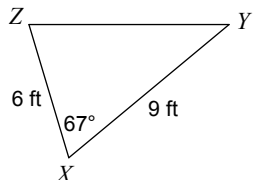
Solve each triangle. Round your answers to the nearest tenth.

76)



Find the area of each triangle to the nearest tenth.

77)

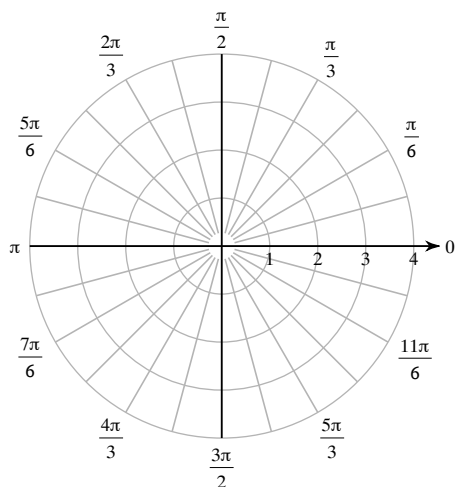


Write each pair of parametric equations in rectangular form.

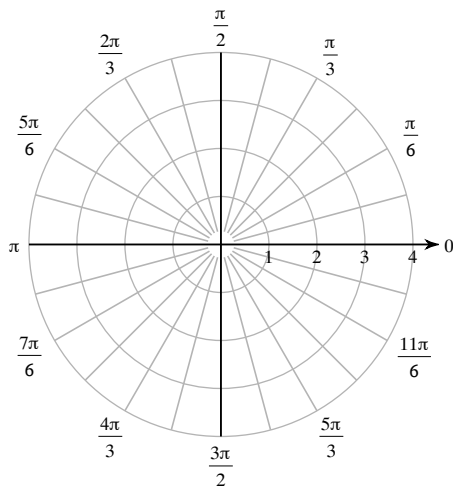
78) $x = -\frac{t^2}{5}, y = t$

Plot the point with the given polar coordinates.

79) $\left(3, \frac{3\pi}{4}\right)$

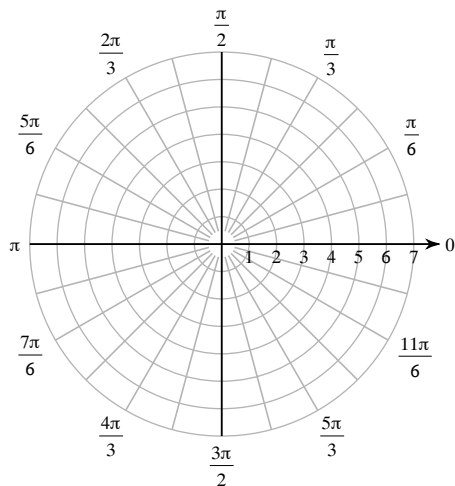


80) $(3, \pi)$

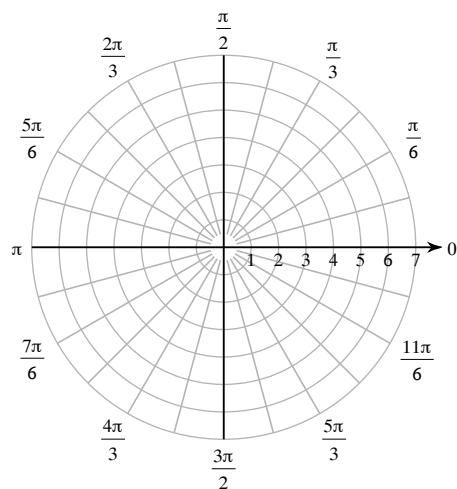


Consider each polar equation over the given interval. Classify the curve; determine if the graph is symmetric with respect to the origin, polar axis, and line $\theta=\pi/2$; find the values of θ where r is zero; find the maximum $|r|$ value and the values of θ where this occurs; and sketch the graph.

81) $r = -\cos \theta, 0 \leq \theta < \pi$

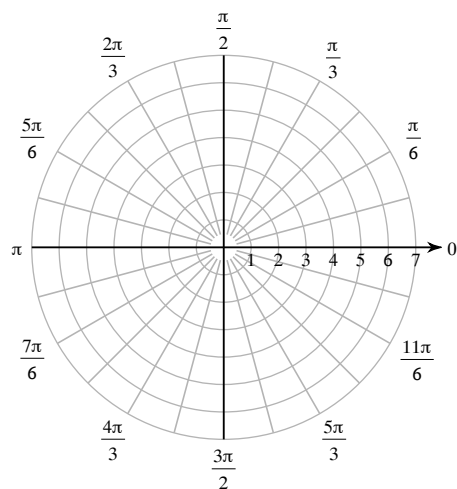


82) $r = -\sin \theta, 0 \leq \theta < \pi$



Each polar equation describes a conic section with a focus at the origin. Find the eccentricity, find the equation of the directrix associated with the focus at the origin, classify the conic section, and graph the polar equation.

83) $r = \frac{7}{5 + 7\sin \theta}$



Convert each equation from rectangular to polar form.

84) $y = \frac{x^2}{2}$

85) $x^2 + (y + 1)^2 = 1$

Convert numbers in rectangular form to polar form and numbers in polar form to rectangular form.

86) $6\left(\cos \frac{\pi}{3} + i\sin \frac{\pi}{3}\right)$

87) $\frac{3\sqrt{2}}{2} - \frac{3\sqrt{2}}{2}i$

Simplify. Write "undefined" for expressions that are undefined.

88) $\begin{bmatrix} 6 \\ -3 \end{bmatrix} + \begin{bmatrix} 2 \\ 2 \end{bmatrix}$

89) $\begin{bmatrix} -4 \\ 2 \end{bmatrix} - \begin{bmatrix} 1 \\ -4 \end{bmatrix}$

Evaluate each determinant.

90) $\begin{vmatrix} 5 & -3 \\ 2 & -1 \end{vmatrix}$

91) $\begin{vmatrix} -2 & -1 \\ 5 & 2 \end{vmatrix}$

Find the inverse of each matrix.

92) $\begin{bmatrix} 10 & 7 \\ -12 & -12 \end{bmatrix}$

93) $\begin{bmatrix} -9 & -7 \\ 9 & 6 \end{bmatrix}$

Use Cramer's Rule to solve each system.

$$\begin{aligned} 94) \quad & 2x + 2y = 4 \\ & -x + 3y = 3 \end{aligned}$$

$$\begin{aligned} 95) \quad & -4x - 2y = -17 \\ & -3x + 3y = -9 \end{aligned}$$

Solve each equation or state if there is no unique solution.

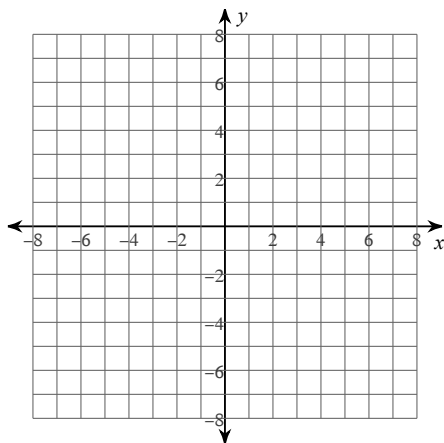
$$96) \begin{bmatrix} 24 & -32 & 20 \end{bmatrix} = -4Z$$

$$97) 2Z = \begin{bmatrix} -12 & 14 & -14 \end{bmatrix}$$

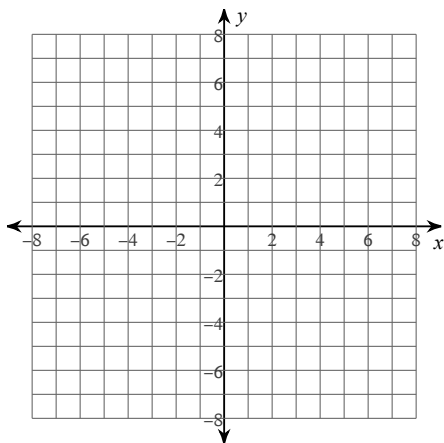
$$98) \begin{bmatrix} 0 & 4 \\ -1 & 3 \end{bmatrix} X = \begin{bmatrix} 20 & -16 \\ 5 & -16 \end{bmatrix}$$

Identify the vertex and axis of symmetry of each. Then sketch the graph.

$$99) y = \frac{1}{2}x^2 - 6x + 13$$



$$100) y = -\frac{1}{2}x^2 - 6x - 12$$

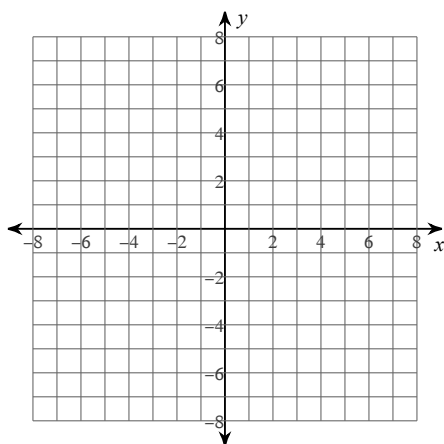


Use the information provided to write the vertex form equation of each parabola.

101) Vertex: $(8, -2)$, Focus: $\left(8, \frac{3}{2}\right)$

Identify the center and radius of each. Then sketch the graph.

102) $(x - 4)^2 + (y - 2)^2 = 4$

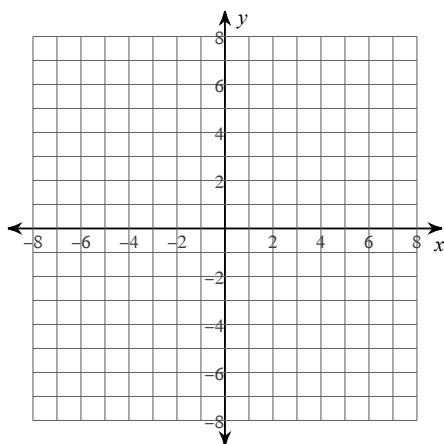


Use the information provided to write the standard form equation of each circle.

103) Center: $(-5, -7)$
Radius: 4

Identify the vertices and foci of each. Then sketch the graph.

104) $\frac{(x+4)^2}{4} + \frac{y^2}{25} = 1$

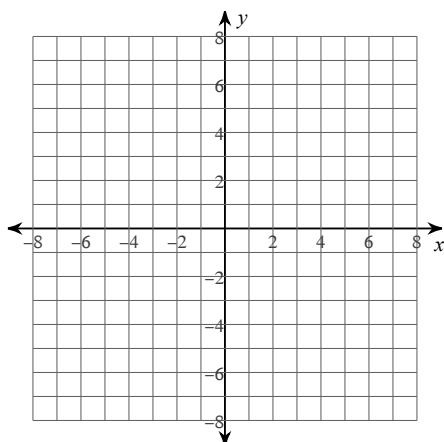


Use the information provided to write the standard form equation of each ellipse.

105) Vertices: $(-2, 16), (-2, -12)$
Foci: $(-2, 2 + \sqrt{115}), (-2, 2 - \sqrt{115})$

Identify the vertices and foci of each. Then sketch the graph.

106) $\frac{(y-2)^2}{4} - \frac{x^2}{25} = 1$



Use the information provided to write the standard form equation of each hyperbola.

107) Vertices: $(3, -8), (-9, -8)$
 Endpoints of Conjugate Axis: $(-3, 1)$
 $(-3, -17)$

Classify each conic section.

108) $u^2 + 2\sqrt{3} \cdot uv + 3v^2 + 4\sqrt{3} \cdot u - 4v = 0$

State if each scenario involves a permutation or a combination. Then find the number of possibilities.

109) The student body of 185 students wants to elect three representatives.

110) Ndiba has homework in five subjects. He is deciding what order to complete them in.

Determine if events A and B are independent.

111) $P(A) = \frac{11}{20}$ $P(B) = \frac{9}{20}$ $P(A \text{ and } B) = \frac{99}{400}$

112) $P(A) = \frac{3}{10}$ $P(B) = \frac{3}{10}$ $P(A \text{ and } B) = \frac{9}{200}$

Determine if events A and B are mutually exclusive.

113) $P(A) = \frac{13}{20}$ $P(B) = \frac{9}{20}$ $P(A \text{ or } B) = \frac{323}{400}$

114) $P(A) = \frac{3}{5}$ $P(B) = \frac{1}{2}$ $P(A \text{ or } B) = \frac{4}{5}$

Find the next three terms in each sequence.

115) 8, 10, 12, 14, 16, ...

116) 1, 1, $\frac{4}{3}$, 2, $\frac{16}{5}$, ...

Determine if the sequence is arithmetic. If it is, find the common difference, the 52nd term, and the explicit formula.

117) 4, 16, 36, 64, ...

118) -20, -15, -10, -5, ...

119) 21, 51, 81, 111, ...

Determine if the sequence is geometric. If it is, find the common ratio, the 8th term, and the explicit formula.

120) -4, -8, -16, -32, ...

121) -3, 9, -27, 81, ...

122) -9, -26, -43, -60, ...

Evaluate the related series of each sequence.

123) 1, -8, -17, -26, -35, -44, -53

124) -8, -17, -26, -35, -44

Evaluate each geometric series described.

125) $2 + 4 + 8 + 16\ldots, n = 8$

126) $-1 + 4 - 16 + 64\ldots, n = 8$

Write each in exponential form.

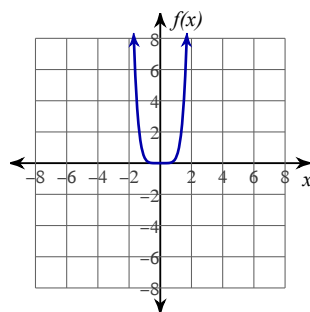
127) $-3\sqrt{2} - i\sqrt{6}$

Answers to Math

1) Continuous at $x = 2$

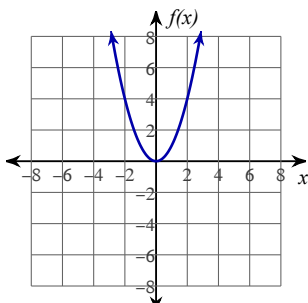
2) Continuous at $x = 2$

3)



Domain: $(-\infty, \infty)$
 Range: $[0, \infty)$
 x-intercept: 0 y-intercept: 0
 $\lim_{x \rightarrow -\infty} f(x) = \infty$ $\lim_{x \rightarrow \infty} f(x) = \infty$
 Continuous on $(-\infty, \infty)$
 Increasing: $(0, \infty)$
 Decreasing: $(-\infty, 0)$

4)

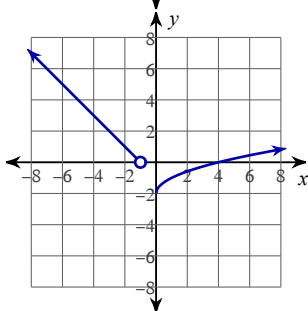


Domain: $(-\infty, \infty)$
 Range: $[0, \infty)$
 x-intercept: 0 y-intercept: 0
 $\lim_{x \rightarrow -\infty} f(x) = \infty$ $\lim_{x \rightarrow \infty} f(x) = \infty$
 Continuous on $(-\infty, \infty)$
 Increasing: $(0, \infty)$
 Decreasing: $(-\infty, 0)$

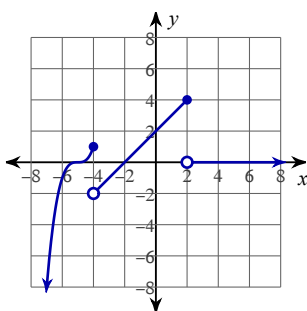
5) 2

6) -2

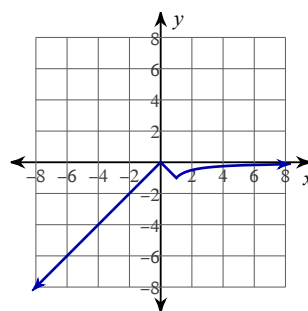
7)



8)



9)



10) reflect across the x-axis
 translate up 2 units

11) compress horizontally by a factor of 3
 translate down 3 units

$$12) g^{-1}(x) = \frac{4x}{3}$$

$$13) g^{-1}(n) = \frac{6 + \sqrt[3]{4n}}{2}$$

$$14) h^{-1}(n) = -\frac{6}{5}n + \frac{2}{5}$$

$$15) g^{-1}(x) = \frac{3}{x+1} - 3$$

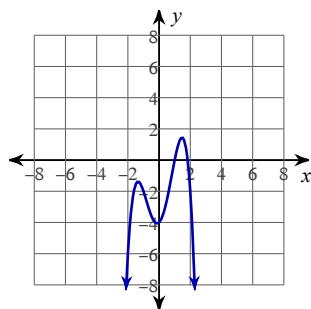
$$16) -9n^2 + 6n + 11$$

$$17) 4a - 6$$

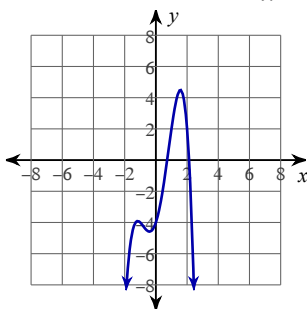
$$18) \frac{3x - 4}{-x^3 + 5x}$$

$$19) 4a^3 + 20a - 4$$

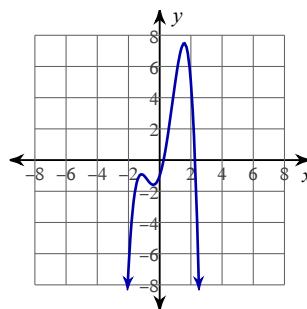
20)



21)



22)



$$23) 3x^3 + 3x^2 + 6x + 8 - \frac{3}{3x+1}$$

$$24) 5x + 8 - \frac{6}{x+3}$$

$$25) 3x + 2 + \frac{8}{3x+6}$$

$$26) x^4 - 3x^3 - 12x^2 + 4x + 2 + \frac{6}{x-1}$$

$$27) 5x + 9 - \frac{6}{x+4}$$

$$28) -2$$

$$29) -6$$

$$30) -18$$

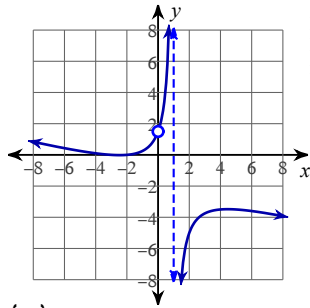
$$31) f(x) = 3x^4 + 16x^3 - 22x^2 - 144x - 45$$

$$32) f(x) = x^3 - x^2 - 6x$$

$$33) \left\{ 2i\sqrt{2}, -2i\sqrt{2}, \frac{\sqrt{5}}{5}, -\frac{\sqrt{5}}{5} \right\}$$

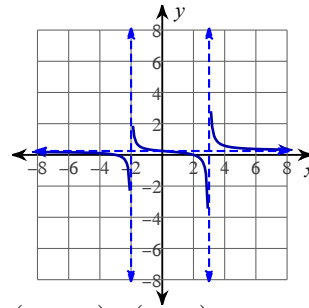
$$34) \left\{ \frac{1}{2}, -1 \text{ mult. } 2 \right\}$$

35)



Holes: $x = 0$
 Horz. Asym.: None
 x-intercepts: $-3, -2$, y-intercept: None

36)

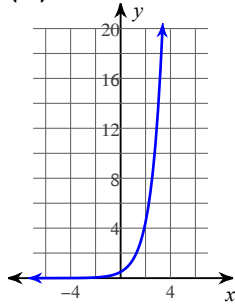


Holes: None
 Horz. Asym.: $y = \frac{1}{4}$
 x-intercepts: $2, -3$, y-intercept: $\frac{1}{4}$

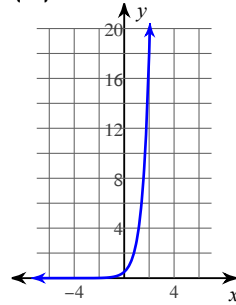
37) $\left\{\frac{7}{4}\right\}$

38) $\left\{\frac{7}{2}\right\}$

41)



42)



45) $5^4 = 625$

46) 3

47) 3

48) $y = 4^{-\frac{x}{6}}$

49) $y = 10^{\frac{x}{4}}$

50) $3 \log_3 x - 3 \log_3 y$

51) $\log_7 w + \frac{\log_7 u}{3} + \frac{\log_7 v}{3}$

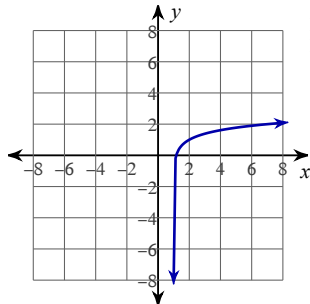
52) $\log_9 u + \log_9 v + 3 \log_9 w$

53) 6.7346

55) $\{12\}$

56) No solution.

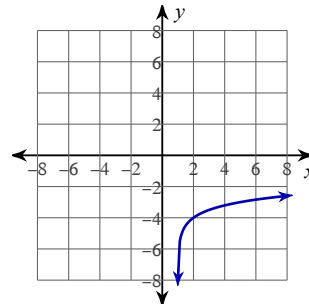
58)



Domain: $x > 1$
 Range: All reals

57) $\{2\}$

59)



Domain: $x > 1$
 Range: All reals

60) \$6,483.37

61) \$23,348.80

64) -60°

65) -715°

68) $\frac{\sqrt{5}}{2}$

69) 2

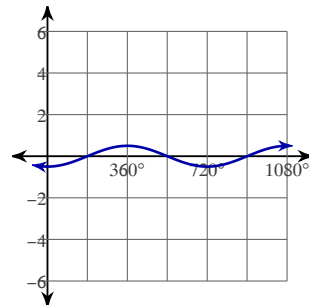
62) \$8,185.24

63) 745°

66) -675°

67) 61°

70)



71) $\{30, 210\}$

72) $\frac{\sqrt{13}}{13}$

73) $\frac{5}{3}$ and $\frac{4}{5}$

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

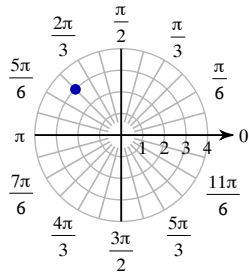
75) 24°

76) $m\angle A = 32^\circ, m\angle B = 118^\circ, m\angle C = 30^\circ$

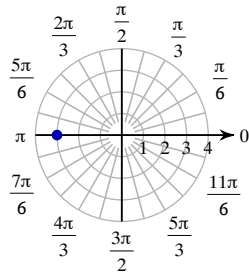
77) 24.9 ft^2

78) $x = -\frac{y^2}{5}$

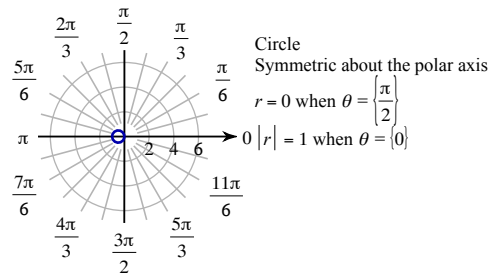
79)



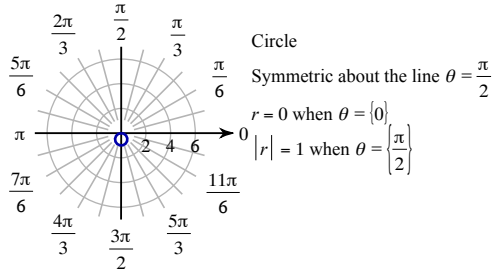
80)



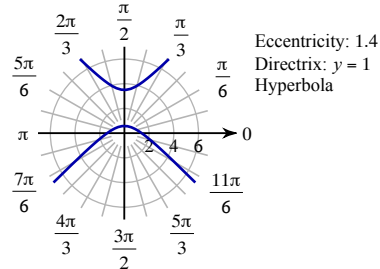
81)



82)



83)



84) $r = 2 \tan \theta \sec \theta$

85) $r = -2 \sin \theta$

87) $3(\cos 315 + i \sin 315)$

88) $\begin{bmatrix} 8 \\ -1 \end{bmatrix}$

86) $3 + 3i\sqrt{3}$

89) $\begin{bmatrix} -5 \\ 6 \end{bmatrix}$

90) 1

91) 1

92) $-\frac{1}{36} \cdot \begin{bmatrix} -12 & -7 \\ 12 & 10 \end{bmatrix}$

93) $\frac{1}{9} \cdot \begin{bmatrix} 6 & 7 \\ -9 & -9 \end{bmatrix}$

94) $\left(\frac{3}{4}, \frac{5}{4}\right)$

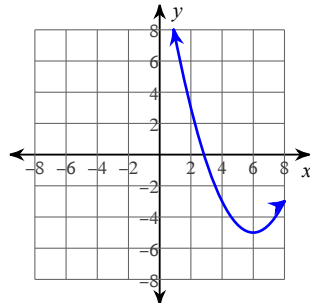
95) $\left(\frac{23}{6}, \frac{5}{6}\right)$

96) $\begin{bmatrix} -6 & 8 & -5 \end{bmatrix}$

97) $\begin{bmatrix} -6 & 7 & -7 \end{bmatrix}$

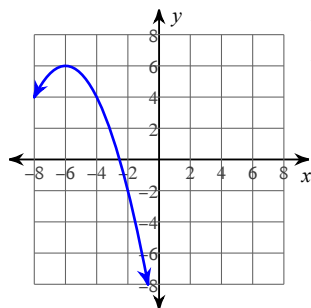
98) $\begin{bmatrix} 10 & 4 \\ 5 & -4 \end{bmatrix}$

99)



Vertex: (6, -5)
Axis of Sym.: $x = 6$

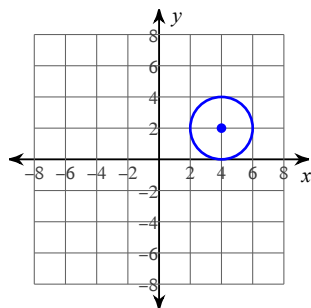
100)



Vertex: (-6, 6)
Axis of Sym.: $x = -6$

101) $y = \frac{1}{14}(x - 8)^2 - 2$

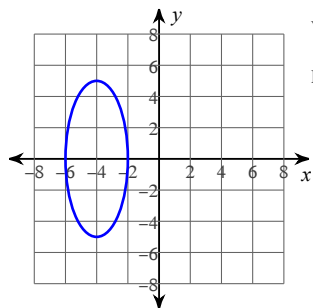
102)



Center: (4, 2)
Radius: 2

103) $(x + 5)^2 + (y + 7)^2 = 16$

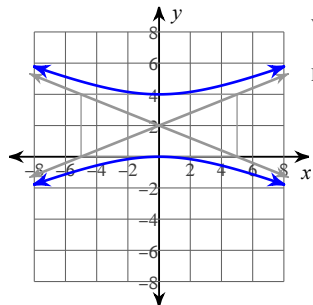
104)



Vertices: $(-4, 5)$
 $(-4, -5)$
 Foci: $(-4, \sqrt{21})$
 $(-4, -\sqrt{21})$

$$105) \frac{(x+2)^2}{81} + \frac{(y-2)^2}{196} = 1$$

106)



Vertices: $(0, 4)$
 $(0, 0)$
 Foci: $(0, 2 + \sqrt{29})$
 $(0, 2 - \sqrt{29})$

$$107) \frac{(x+3)^2}{36} - \frac{(y+8)^2}{81} = 1$$

108) Parabola

109) Combination; 1,038,220

110) Permutation; 120

111) Independent

112) Dependent

113) Not mutually exclusive

114) Not mutually exclusive

115) 18, 20, 22

116) $\frac{16}{3}, \frac{64}{7}, 16$

117) Not arithmetic

118) Common Difference: $d = 5$

$$a_{52} = 235$$

$$\text{Explicit: } a_n = -25 + 5n$$

119) Common Difference: $d = 30$ 120) Common Ratio: $r = 2$

$$a_{52} = 1551$$

$$a_8 = -512$$

$$\text{Explicit: } a_n = -9 + 30n$$

$$\text{Explicit: } a_n = -4 \cdot 2^{n-1}$$

121) Common Ratio: $r = -3$

122) Not geometric

123) -182

$$a_8 = 6561$$

$$\text{Explicit: } a_n = -3 \cdot (-3)^{n-1}$$

124) -130

125) 510

126) 13107

$$127) 2\sqrt{6} \cdot e^{\frac{7i\pi}{6}}$$