



AP Pre-Calculus Summer Math Packet

Congratulations! You have conquered Algebra and Geometry and have made it to Pre-Calculus! Math class next year will be filled with many new and difficult concepts. Pre-Calculus is a college level course offered in high school. It requires much commitment, planning and time to practice new skills and to gain understanding of challenging concepts needed for the study of Calculus.

This summer math packet is a review of some of the concepts learned in your Algebra II Honors class that are needed when you begin your Pre-Calculus course in August. It will assure that all students begin the school year on the same page and with equal opportunity to learn and build upon mathematical concepts you should have mastered in your Algebra II Honors class.

Instructions for completing the packet:

- Please print the packet or use loose leaf paper to complete the packet by hand showing all work. Work must be neat and legible.
- Please use your Pre-Calculus notes or the websites provided to help you if you need reminders on how to complete some practice problems.
- Take notes as you complete your work. You will be given a quiz on this material the first week of school.
- Work on the packet with your friends. Help each other. Every student is responsible for knowing the material in this packet when you return in August. We will review as a team and everyone will be expected to participate.
- Bring your packet to our first class together. It will be collected for a grade. Only packets done with paper and pencil will be accepted.

Helpful Websites:

<http://www.mathtv.com/>

<http://www.purplemath.com/modules/index.htm>

<https://www.khanacademy.org>

Helpful for graphing functions:

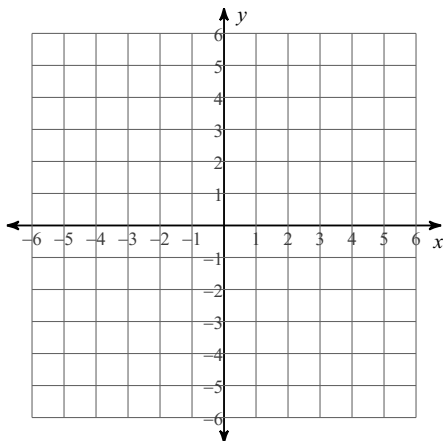
<https://www.education.ti.com/en/resources/family-of-functions>

Please show all work

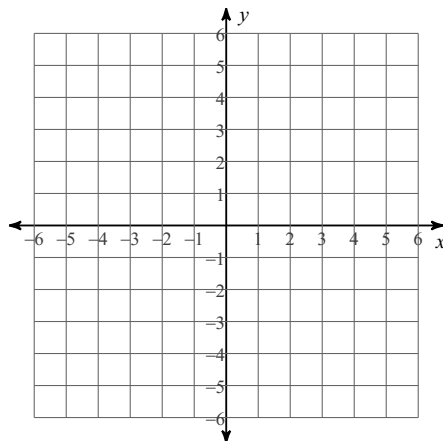
Date _____ Period _____

LINEAR EQUATIONS & INEQUALITIES**Sketch the graph of each line. Identify intercepts, slope, and domain and range.**

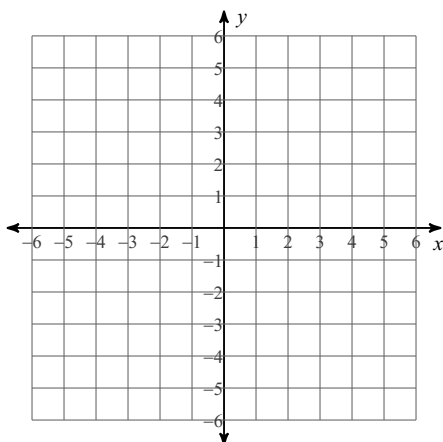
1) $x = -4$



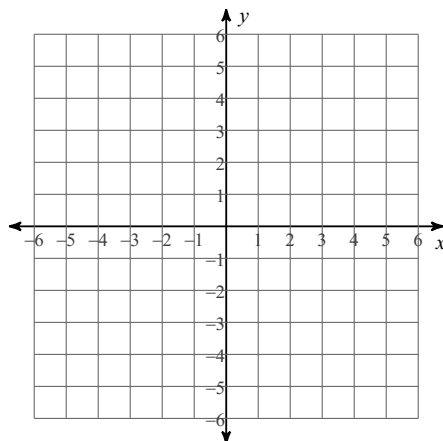
2) $7x - 4y = 20$



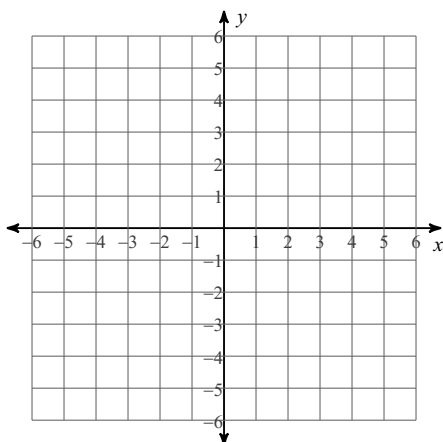
3) $y = -\frac{3}{5}x$



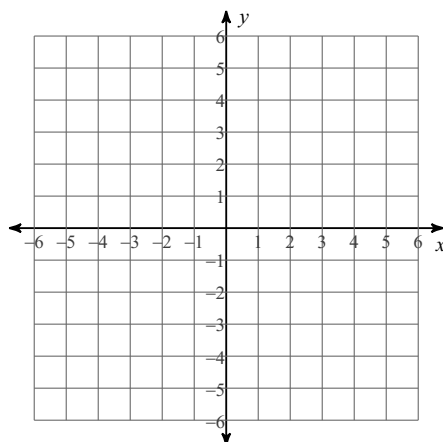
4) $y = -5$

**Sketch the graph of each linear inequality.**

5) $x \leq 4$



6) $2x + 3y > 3$

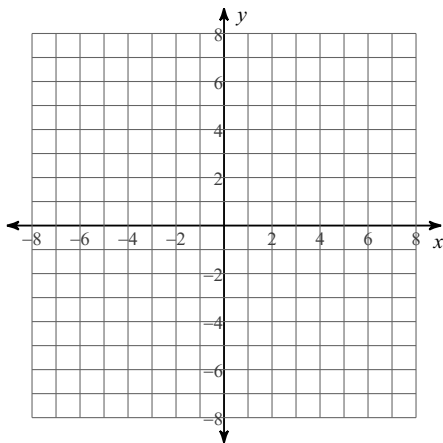


QUADRATIC FUNCTIONS

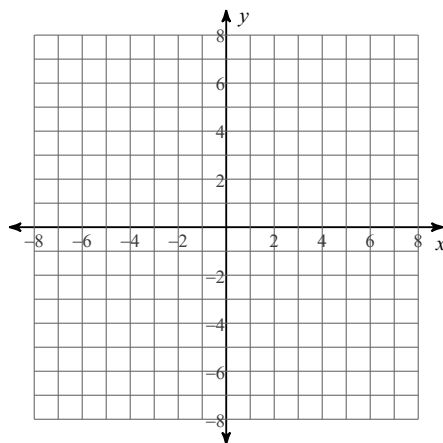
Identify the vertex, axis of symmetry, direction of opening, min/max value, y-intercept, and x-intercepts of each. Then sketch the graph.

Reminder: If the equation is in vertex form the vertex (h,k) is easily identified. If the equation is in standard form, the x-coordinate of the vertex is $-b/2a$ and the y-coordinate is found by evaluating the function using the x-coordinate of the vertex.

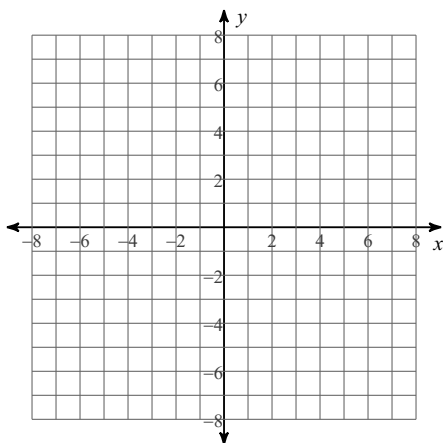
7) $y = 2x^2$



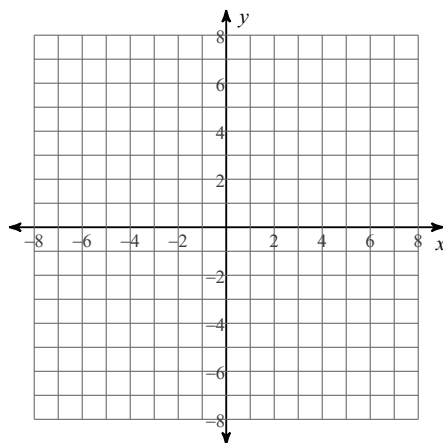
8) $y = \frac{1}{2}x^2$



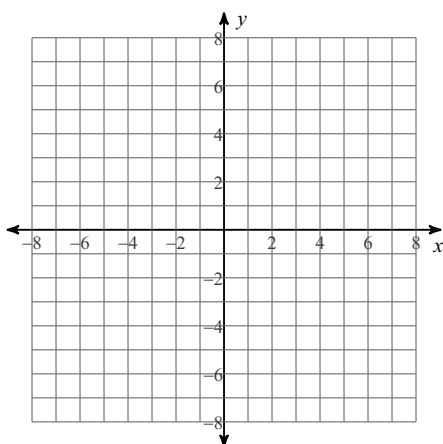
9) $y = -(x - 3)^2 + 1$



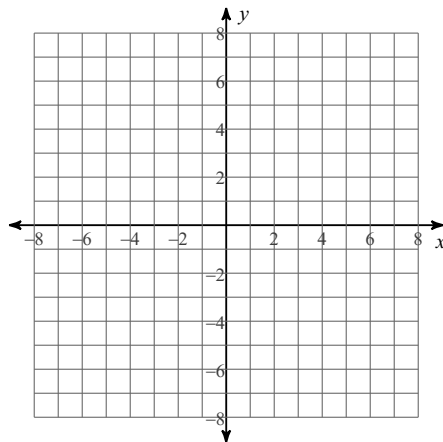
10) $y = 2(x - 3)^2 - 2$



11) $y = -\frac{1}{2}x^2 - 4x - 8$



12) $y = x^2 + 8x + 15$



Solve each quadratic equation.

Reminder: Quadratic equations can be solved by factoring, using the square root property, using the quadratic formula, or completing the square. Please show that you know how to use all the methods by following the instructions.

Solve by factoring.

13) $x^2 = -5x$

14) $x^2 - 8x = -12$

15) $5n^2 + 64 = -48n$

16) $10a^2 - 105a = -200$

Solve by taking square roots.

17) $7x^2 - 8 = 496$

18) $8a^2 - 3 = -140$

Solve by completing the square.

19) $x^2 - 20x + 81 = -10$

20) $4n^2 - 8n = 6$

Solve with the quadratic formula.

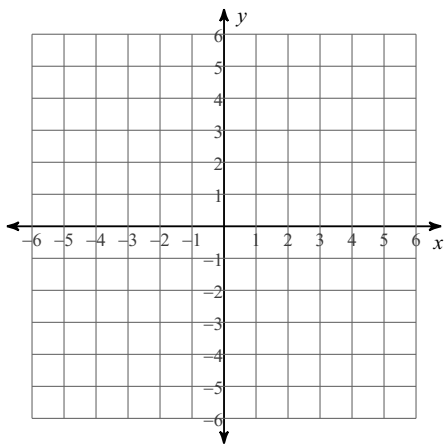
21) $8n^2 = -5 - 2n$

22) $4n^2 + 5n = -1$

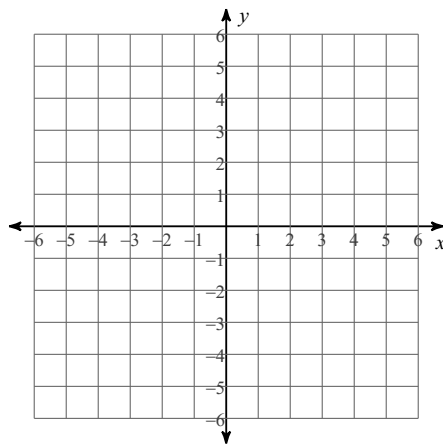
ABSOLUTE VALUE FUNCTIONS

Reminder: To graph an absolute value function you must first identify the vertex and then graph. If the variable inside of the absolute value bars has a coefficient, remember to factor the coefficient outside of the bars before identifying the vertex.

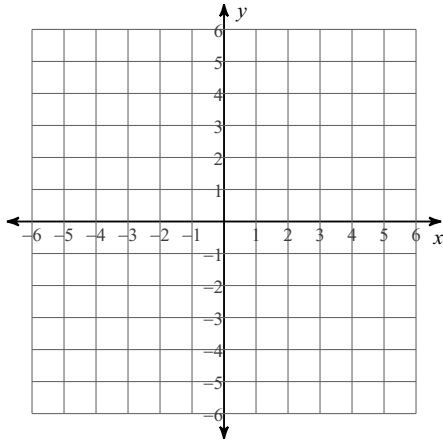
23) $y = -|x - 1| + 4$



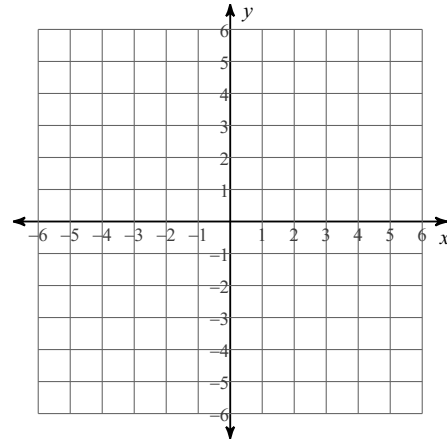
24) $y = |x| - 2$



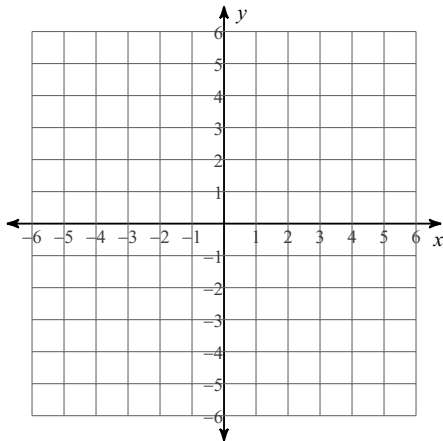
25) $y = -3|x - 1| - 1$



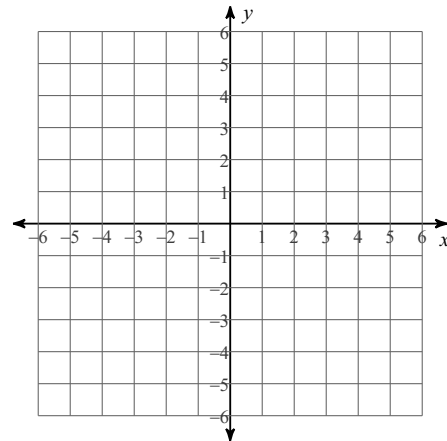
26) $y = 2|x + 3| - 2$



27) $y = |2x - 1| + 1$



28) $y = -|3x + 3| + 2$



Solve each absolute value equation.

Reminder: To solve an absolute value equation you must first isolate the absolute value term on one side of the equation. You may have no solution, one solution, or two solutions. Absolute value equations may contain extraneous solutions, so you must always check your answers.

29) $\left| \frac{n}{6} \right| - 3 = -2$

30) $|r - 9| + 2 = 7$

31) $4 + 3|r + 6| = 4$

32) $3|-5 + n| - 7 = -55$

Solve each absolute value inequality and give the solution using interval notation.

33) $2\left|\frac{n}{9}\right| - 5 > -3$

34) $4|n - 4| - 2 < -26$

35) $9|10 + x| - 1 \geq -19$

36) $3 - |-3 + x| \leq -3$

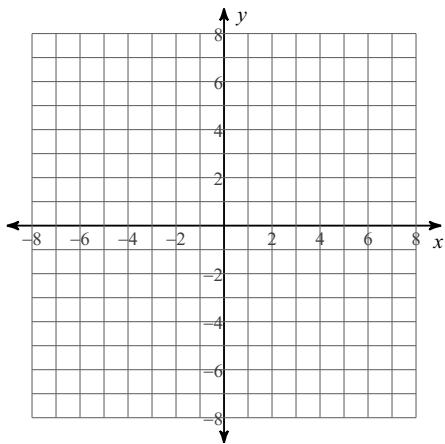
37) $-2|1 + x| + 5 \geq -7$

38) $-3 + 4|n + 6| \leq 57$

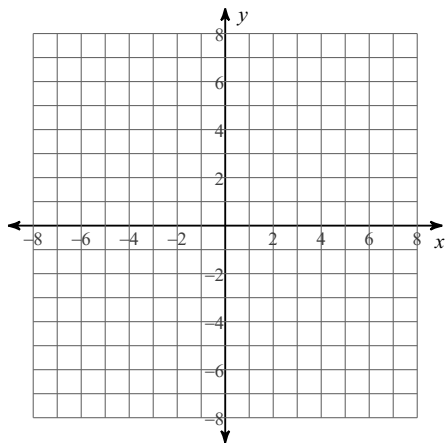
RADICAL FUNCTIONS

Sketch the graph of each function by using transformations. State the domain and range.

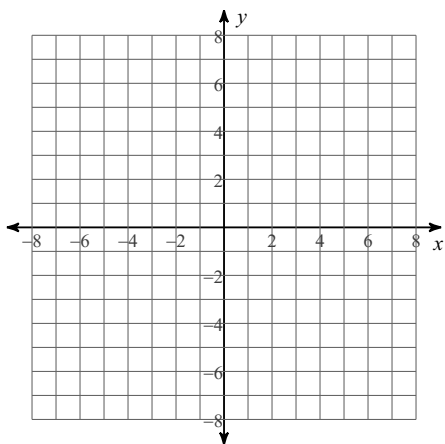
39) $y = \sqrt{x}$



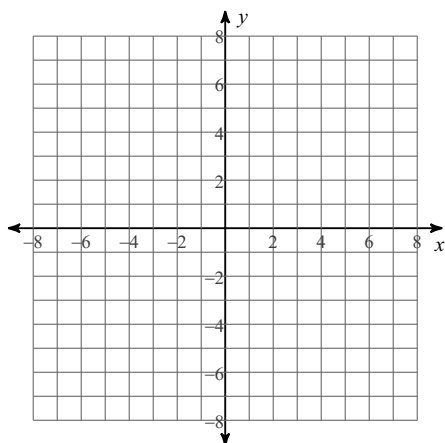
40) $y = -5 + \sqrt{x + 4}$



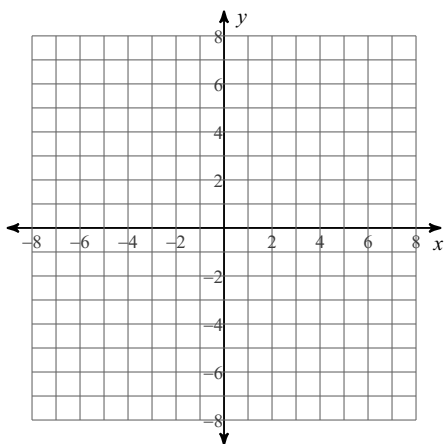
41) $y = 4\sqrt{x - 4} - 1$



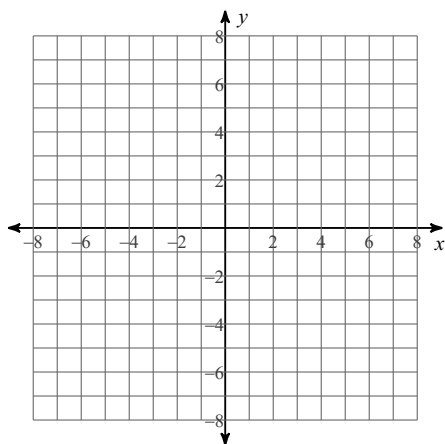
42) $y = \frac{1}{2}\sqrt{x} - 2$



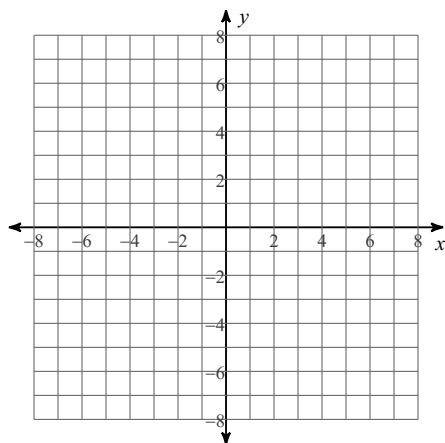
43) $y = -3\sqrt{x}$



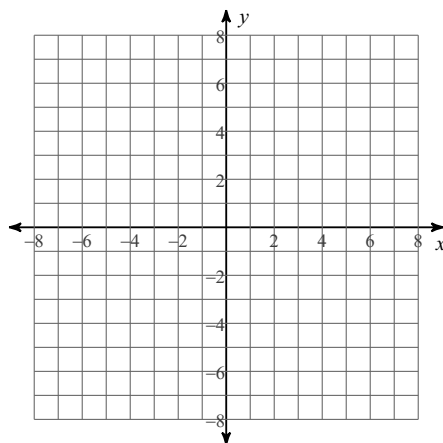
44) $y = -4\sqrt{x} + 4$



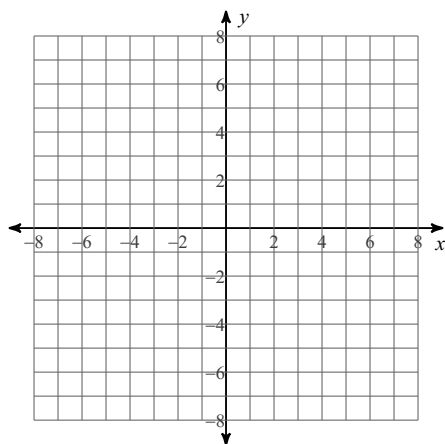
45) $y = \sqrt[3]{x}$



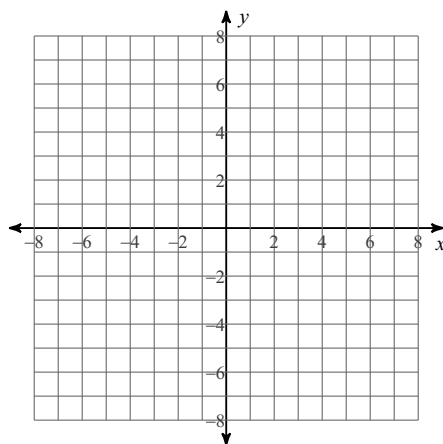
46) $y = 2\sqrt[3]{x+2}$



47) $y = \sqrt[3]{-x-3} - 4$



48) $y = \sqrt[3]{-8x-48} - 2$



Solve each radical equation. Remember to check for extraneous solutions.

Reminder: To solve radical equations isolate the radical. If two radicals exist, each radical should be on different sides of the equation and make sure only one side of the equation contains a binomial. Square both sides of the equation. If after squaring both sides, a radical still exists, you must repeat the process.

49) $\sqrt{-1-a} = \sqrt{2a+29}$

50) $3 = \sqrt{2n+1}$

$$51) \sqrt{2n+7} - n = -4$$

$$52) \sqrt{9-2b} = \sqrt{-7-2b} + 2$$

Reminder: To solve equations with a radical greater than two isolate the radical and raise both sides of the equation to the value of the index. To solve equations with a rational exponent, isolate the term with the rational exponent and raise both sides of the equation to the value of the reciprocal of the exponent. If a rational exponent contains a numerator with an even number and a denominator with an odd number, then absolute value must be used to solve the equation.

$$53) 7 + 5\sqrt[3]{5k-1} = 27$$

$$54) -11 = -4\sqrt[6]{3x-17} - 3$$

$$55) -6 - (4 - 15a)^{\frac{3}{2}} = -518$$

$$56) -2(-7 - 11r)^{\frac{1}{4}} - 7 = -13$$

$$57) -2(35 - m)^{\frac{4}{3}} - 7 = -519$$

$$58) -8 - \sqrt[4]{2k} = -10$$

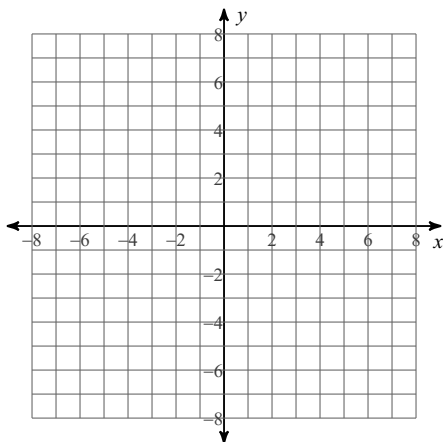
$$59) 2048 = 2(3x + 1)^{\frac{5}{3}}$$

$$60) -5 - 5(n - 29)^{\frac{3}{2}} = -325$$

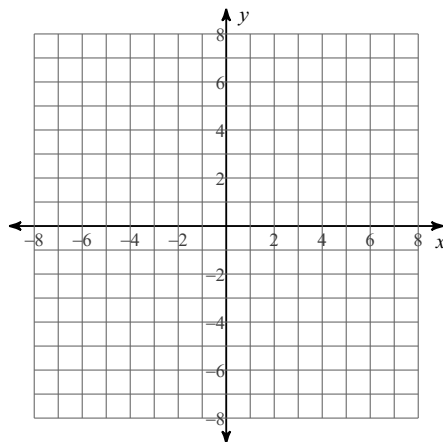
POLYNOMIAL FUNCTIONS

Reminder: To graph a function of degree three or higher you must first find the zeros of the function by factoring or if necessary by using the Rational Root Theorem and synthetic division. Identify the end behavior of the graph, multiplicity of each zero to determine whether the graph touches and turns or crosses the x-axis at the zero, find the y-intercept and then sketch the graph.

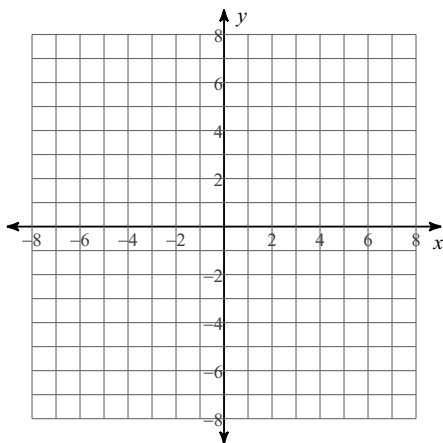
61) $f(x) = x^3 - 3x^2 + 4$



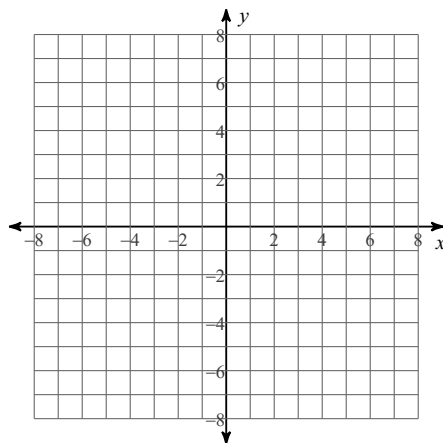
62) $f(x) = x^3 - 3x^2$



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



64) $f(x) = x^3 - x^2$



Solve the equations by finding all roots.

Reminder: To solve equations of degree three or higher, start by attempting to factor the equation. If the equation cannot be factored then use the Rational Root Theorem and synthetic division to find your roots. Once you have reduced your polynomial to linear quadratic factors, you may use the quadratic formula to finish solving the equation.

65) $x^3 + 27 = 0$

66) $x^4 + 5x^2 - 6 = 0$

67) $x^3 - 6x^2 + 5x = 0$

68) $x^4 - 16 = 0$

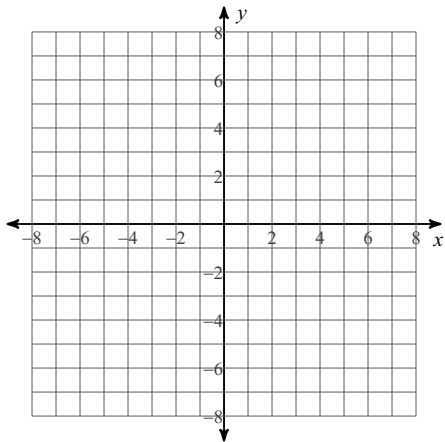
69) $x^3 - 11x^2 - 25x - 13 = 0$

70) $x^4 + 7x^3 - x^2 - 7x = 0$

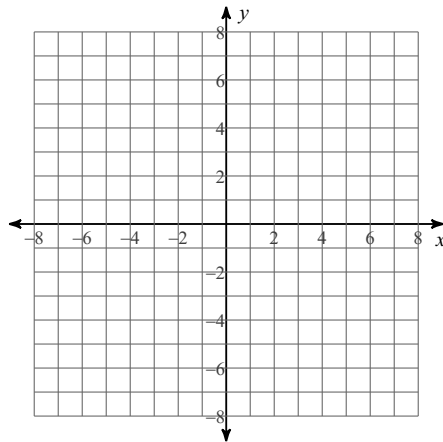
RATIONAL FUNCTIONS

Reminder: To graph rational functions identify the points of discontinuity, holes, vertical asymptotes, x-intercepts, horizontal asymptote, and domain of each. Then sketch the graph.

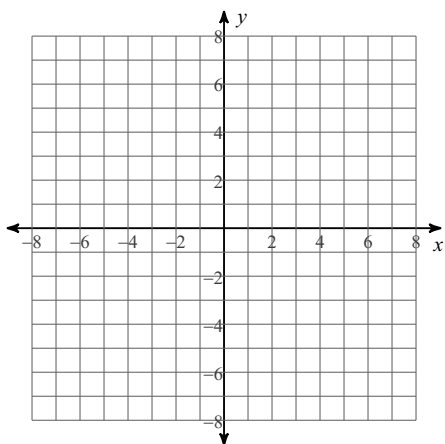
71) $f(x) = \frac{2}{x} - 1$



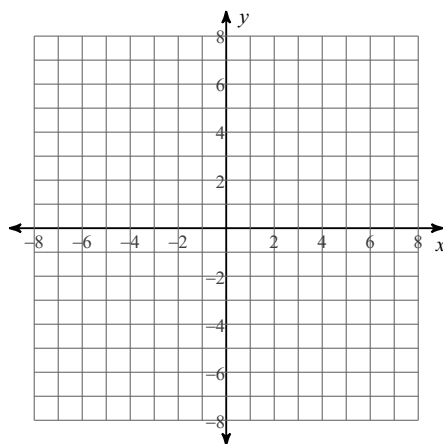
72) $f(x) = -\frac{2}{x-3} + 2$



73) $f(x) = \frac{x+1}{x^2+3x+2}$



74) $f(x) = \frac{-x-2}{x-3}$



Solve each rational equation. Remember to check for extraneous solutions.

Reminder: To solve rational equations first multiply both sides of the equation by the least common denominator. This will clear the fractions or rational expressions. To find the LCD factor the denominators.

$$75) \frac{1}{4} = \frac{3}{2} + \frac{3}{4k}$$

$$76) \frac{1}{5n} + 1 = \frac{3}{5n}$$

$$77) \frac{5k+5}{6k^2} = \frac{k^2+7k+12}{6k^2} - \frac{k+4}{3k^2}$$

$$78) \frac{x+4}{3} = \frac{x^2-x-6}{x} + \frac{1}{x}$$

$$79) \frac{x+1}{5x} + \frac{3x-6}{5x} = \frac{6}{5x^2}$$

$$80) \frac{1}{x^2-2x} = \frac{4}{x^2-2x} - \frac{1}{x-2}$$

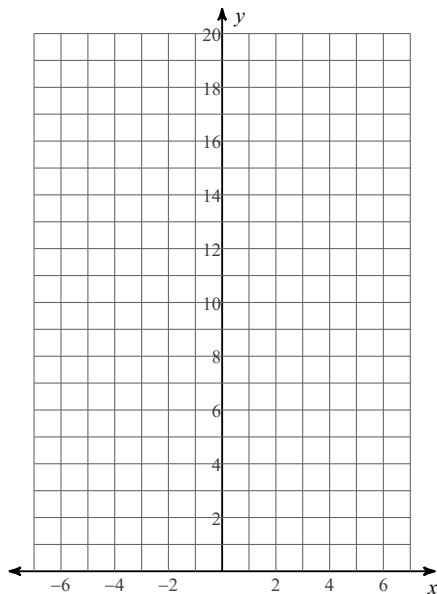
$$81) \frac{x-6}{2x^2-2x-4} - \frac{x+2}{2x+2} = \frac{1}{2x+2}$$

$$82) \frac{2}{x^2} - \frac{x+2}{3x^2} = 1$$

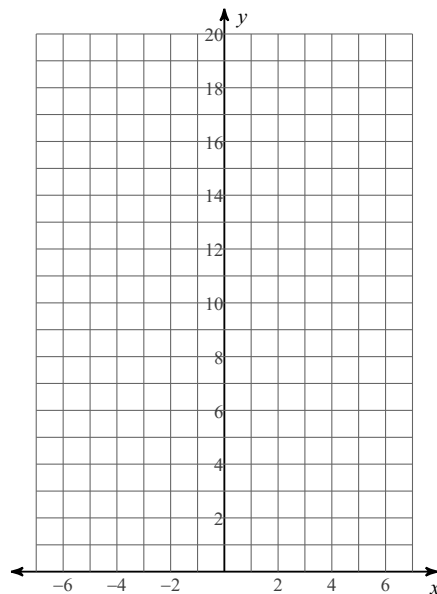
EXPONENTIAL FUNCTIONS

To graph exponential functions, identify transformations, graph the asymptote, and then plot the three basic points ($x=-1$, $x=0$, and $x=1$ at transformation).

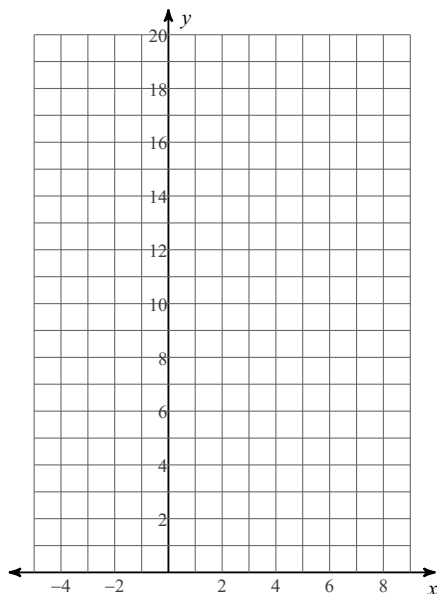
83) $y = \left(\frac{1}{3}\right)^x$



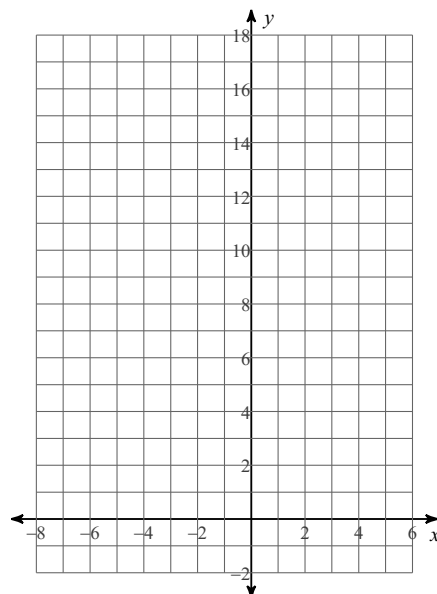
84) $y = 4^x$



85) $y = 2^{x-2} + 1$



86) $y = \left(\frac{1}{4}\right)^{x+1} - 2$



Solve each exponential equation.

Reminder: To solve an exponential equation you must first isolate the exponential term on one side of the equation. If both sides of the equation can be converted to a term with the same base, then the equation can be solved by simply equating the exponents once the terms have the same base. If this is not possible, then you must solve by using logarithms.

87) $5^{-2k} = 5^{2k+3}$

88) $1000^{3m} = 10000^{3-m}$

89) $2^{-3n} \cdot 2^{-2n} = 2^4$

90) $81^{-2n} = 3^3$

91) $\left(\frac{1}{4}\right)^{2x} = 16^{3x}$

92) $16^{2x-3} = \left(\frac{1}{64}\right)^{-3x}$

93) $10^{9n} = 57$

94) $-2 \cdot 10^x = -57$

95) $8e^{9r} = 81$

96) $10e^{n-10} = 33$

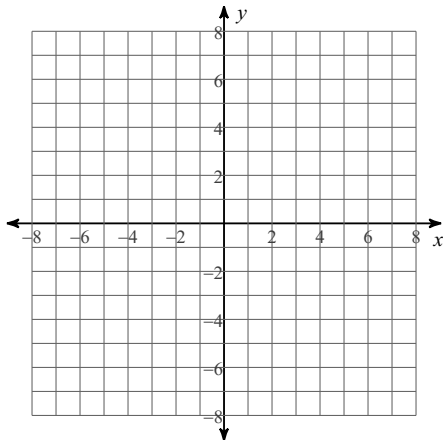
97) $19^{-2x-4} - 9 = 35$

98) $3 \cdot 2^{-n-6} = 49$

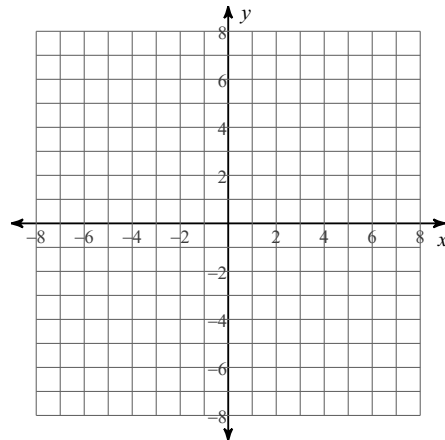
LOGARITHMIC FUNCTIONS

Reminder: To graph logarithmic functions, isolate the log, change the equation to exponential, identify transformations and sketch the graph. Make sure to show the vertical asymptote.

99) $y = \log(x + 5)$



100) $y = \ln(x - 3) + 3$



Evaluate each expression without the use of a calculator.

101) $\log_6 \frac{1}{36}$

102) $\log_4 16$

103) $\log_7 49$

104) $\log_3 1$

105) $\log \frac{1}{10}$

106) $\log_2 16$

107) $\ln 1$

108) $\ln e^3$

Solve each logarithmic equation. Give exact solution.

Reminder: If both sides of an equation contain one logarithmic term with the same base then the equation can be solved by setting the terms inside of the parenthesis equal to each other. If this is not the case, then use the properties of logarithms to condense the logarithms on one side of the equation. Convert the equation to exponential form and solve.

109) $\log_4(k^2 + 2k) = \log_4(49 + 2k)$

110) $8\log_5(p - 10) = 24$

$$111) -9 \ln 7p + 1 = -35$$

$$112) -9 - \ln (n - 10) = -11$$

$$113) \ln (x + 5) + \ln 7 = 3$$

$$114) \log 5x^2 + \log 2 = 5$$

$$115) \log (x + 5) - \log x = \log 9$$

$$116) \ln 2x^2 + \ln 8 = 2$$

PROPERTIES OF EXPONENTS

Simplify. Your answer should contain only positive exponents.

$$117) \frac{2y}{(2x^{-3})^4 \cdot x^{-3}y^{-3}}$$

$$118) \left(\frac{2xy^{-4}}{2x^{-1} \cdot xy^4} \right)^{-3}$$

$$119) \frac{(2yx^2)^2 \cdot x^3y^3}{x^{-2}y^4}$$

$$120) \frac{(2x^3y^2)^4}{x^3y^{-4} \cdot 2y}$$

OPERATIONS WITH RADICALS

Simplify without the use of a calculator. Use absolute value signs when necessary.

$$121) \sqrt[3]{-81a^6}$$

$$122) \sqrt{75x^3}$$

$$123) \sqrt[3]{-48n^2}$$

$$124) \sqrt[4]{243r^4}$$

$$125) \sqrt{75mn^3}$$

$$126) \sqrt{144x^3y^2}$$

$$127) \sqrt{147xy^3}$$

$$128) \sqrt{12m^2n}$$

Simplify.

129) $3\sqrt[3]{162} - 2\sqrt[3]{162}$

130) $2\sqrt{18} + 2\sqrt{2} + 3\sqrt{3}$

131) $\sqrt[3]{36x^3} \cdot 4\sqrt[3]{-3x^2}$

132) $\sqrt{12x^2} \cdot \sqrt{10x^3}$

133) $\sqrt{6}(4 + \sqrt{6})$

134) $-4\sqrt{10}(\sqrt{2} - 4\sqrt{6})$

135) $\frac{2\sqrt{3xy^3}}{\sqrt{15x^3y^2}}$

136) $\frac{\sqrt{2x}}{\sqrt{3x^3}}$

137) $\frac{\sqrt[3]{2x^4} + \sqrt[3]{x^2}}{3\sqrt[3]{4x^2}}$

138) $\frac{3\sqrt{2x}}{4x - \sqrt{3x^4}}$

139) $\frac{3}{5x - \sqrt{2x}}$

140) $\frac{-3x - \sqrt{x^2}}{4x - \sqrt{x}}$

Trigonometric Functions

Using radians, find the period of each function. Then graph one cycle on the negative side of the x-axis and one cycle to the right of the x-axis.

141) $y = \cos \theta$

142) $y = \sin \theta$

Using radians, find the period of each function. Graph at least three cycles. Include asymptotes.

143) $y = \cot \theta$

144) $y = \tan \theta$

Graph two cycles of the cosine or sine function first, one cycle on the negative side of the x-axis and one on the positive side of the x-axis. Graph asymptotes and then graph the secant or cosecant graph.

145) $y = \csc \theta$

146) $y = \sec \theta$

Find the exact value of each trigonometric function without a calculator. Show your work. If necessary find a coterminal angle. Find the reference angle, and lastly find whether the answer is positive or negative depending on the function and the quadrant the angle landed on.

147) $\tan \frac{31\pi}{6}$

148) $\cot 630^\circ$

149) $\sin -\frac{35\pi}{6}$

150) $\sec \frac{14\pi}{3}$

151) $\cot \frac{11\pi}{4}$

152) $\sin \frac{15\pi}{4}$

153) $\sec -\frac{31\pi}{6}$

154) $\csc 660^\circ$

155) $\cot -\frac{7\pi}{2}$

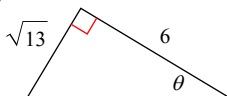
156) $\tan \frac{11\pi}{2}$

157) $\cos \frac{9\pi}{2}$

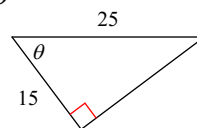
158) $\csc -\frac{17\pi}{4}$

Find the value of the trig function indicated.

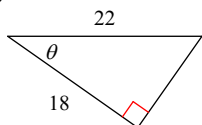
159) $\cos \theta$



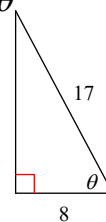
160) $\sin \theta$



161) $\cot \theta$



162) $\csc \theta$



OPERATIONS WITH RATIONAL EXPRESSIONS

Simplify each expression.

$$163) \frac{2y}{2x} + \frac{6x}{4x}$$

$$164) \frac{2x}{6y^2} - \frac{2x}{2y^2}$$

$$165) \frac{4x}{x+4} - \frac{5x}{3x+6}$$

$$166) \frac{r-1}{r+6} - \frac{6}{4r}$$

Simplify each and state the excluded values.

$$167) \frac{90-9x}{x^2-100} \div \frac{27x+36}{9x+12}$$

$$168) \frac{9x+54}{4x+16} \cdot \frac{4x+16}{x+6}$$

$$169) \frac{8r^2}{8r^3-72r^2} \cdot \frac{r^2+r-6}{9r+27}$$

$$170) \frac{x^2-2x-48}{-x^2+17x-72} \div \frac{7x-14}{x-2}$$

COMPLEX FRACTIONS

Simplify each expression.

$$171) \frac{\frac{m-2}{m^2} + \frac{m-2}{25}}{m-2}$$

$$172) \frac{\frac{x}{3} - \frac{9}{x^2}}{\frac{3}{x} - \frac{9}{x^2}}$$

$$173) \frac{\frac{4}{yx} - \frac{x}{2}}{xy}$$

$$174) \frac{\frac{1}{m} - \frac{1}{2}}{n+4}$$

COMPLEX NUMBERS

Simplify.

$$175) (3 - 2i) - (4 + 7i)$$

$$176) (8i)(7 - 6i) - 3(8 - 7i)$$

$$177) (-4i)(-6i)(6 + 6i)$$

$$178) \frac{1}{9 + 10i}$$

$$179) \frac{4 + 4i}{-7i}$$

$$180) \frac{-2 + 3i}{-6 + 6i}$$

Part II Problem Solving and Graphing Calculator Practice

Name _____

Solve the word problems below by defining your variables and using an equation. Show all work.

1) The perimeter of a rectangle is 78 m. If the width were doubled and the length were increased by 16 m, the perimeter would be 138 m. What are the length and width of the rectangle? 1) _____

2) The height of a box is 6 inches. The length is three inches more than the width. Find the width if the volume is 240 cu inches. 2) _____

3) A rock falls from a tower that is 416 ft high. As it is falling, its height is given by the formula $h = 416 - 16t^2$. How many seconds will it take for the rock to hit the ground ($h=0$)? 3) _____

- 4) A projectile is thrown upward so that its distance above the ground after t seconds is $h = -11t^2 + 286t$. After how many seconds does it reach its maximum height? 4) _____
- 5) The number of mosquitoes $M(x)$, in millions, in a certain area depends on the June rainfall x , in inches: $M(x) = 2x - x^2$. What rainfall produces the maximum number of mosquitoes? 5) _____
- 6) Joe Pearlman received a 2.75% pay decrease. His salary after the decrease was \$36,955. What was his salary before the decrease? 6) _____
- 7) Between 1990 and 2000 the population of a certain city grew from 202,000 to 239,700. What was the percentage increase in the population of the city? 7) _____

Solve the problem by using the distance formula. ($D = RT$)

8) A traveling salesperson averaged 48 miles per hour on a 246 mile trip. How many hours were spent on the trip? 8) _____

9) An airplane leaves Los Angeles for Denver at a speed of 400 mph. Thirty minutes later, a plane going from Denver to Los Angeles leaves Denver, which is 850 miles from Los Angeles, at a speed of 470 mph. When they meet, how far are they from Denver? 9) _____

Solve the following problems using a system of equations.

10) Anne and Nancy use a metal alloy that is 18.6% copper to make jewelry. How many ounces of a 12% alloy must be mixed with a 23% alloy to form 75 ounces of the desired alloy? 10) _____

11) Jaya has \$16,000 to invest. She invests part of it in an account paying 6% simple interest and the rest in an account paying 7% simple interest. If her annual income is \$1080, how much does she have invested in each account? 11) _____

12) A theatre sells two types of tickets to their plays; children's tickets and adult tickets. For today's performance they have sold a total of 1134 tickets. Also, they have sold 80 more adult tickets than children's tickets. How many adult tickets have they sold? 12) _____

13) With the current, you can row 33 miles in 4 hours. Against the same current, you can row only $\frac{2}{3}$ of this distance in 5 hours. Find your average rowing velocity in still water. 13) _____

14) The speed of a freight train is 23 mph slower than that of a passenger train. The freight train travels 350 mi in the same time it takes the passenger train to travel 440 mi. Find the speed of the passenger train. 14) _____

15) Two cars leave a city and head in the same direction. After 2 hours, the faster car is 22 miles ahead of the slower car. The slower car has traveled 84 miles. Find the speeds of the two cars. 15) _____

Use a graphing calculator to approximate the real zeros of the function defined by $f(x)$. Express decimal approximations to the nearest hundredth.

16) $f(x) = x^4 + 5.77x^3 + 20.80x^2 + 25.88x + 9.34$ 16) _____

17) $x^3 + 3x^2 + 3x + -3 = 0$ 17) _____

18) $f(x) = -\sqrt{11}x^3 + \sqrt{10}x + \sqrt{7}$ 18) _____

19) $2x^2 + 11x + 4 = 0$ 19) _____

Use your graphing calculator and regression to solve the problem. Round numbers to the nearest hundredth.

20) The ages and lengths of several animals of the same species are recorded in the following table: 20) _____

Age (months)	Length (inches)
12	10
15	11
17	17
21	23
26	23
28	24
32	32
38	40
41	38

Find the linear regression model.

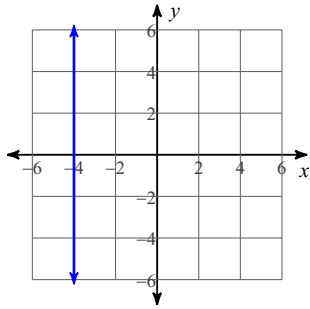
Use your graphing calculator to graph both equations of the system of equations. Solve the system by finding the intersection of the two lines.

21)
$$\begin{cases} 5x + 4y = 74 \\ 5x + 2y = 82 \end{cases}$$
 21) _____

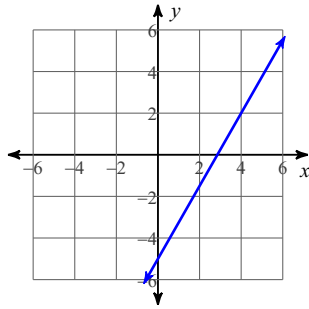
Part 1

Answers to Please show all work (ID: 1)

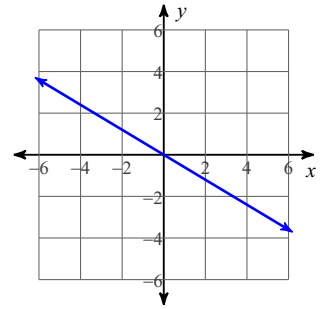
1)



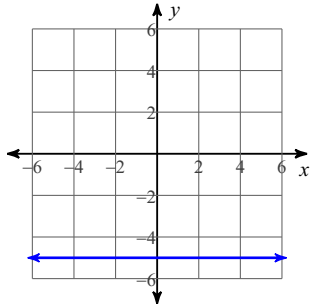
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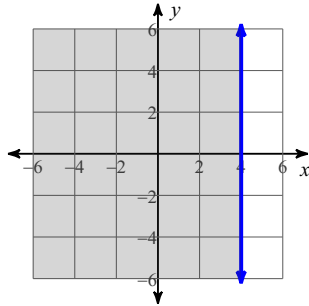
3)



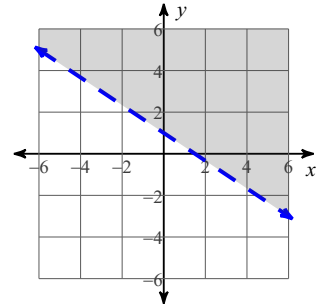
4)



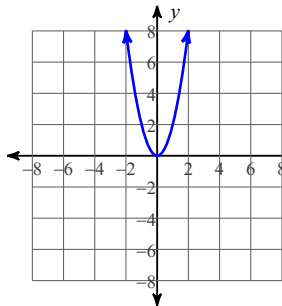
5)



6)

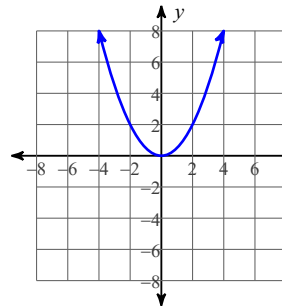


7)



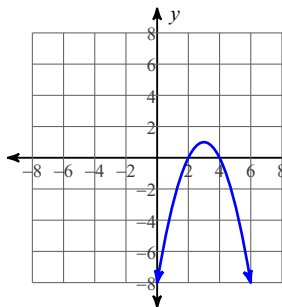
Vertex: $(0, 0)$
Axis of Sym.: $x = 0$
Opens: Up
Min value = 0
y-int: 0
x-int: 0

8)



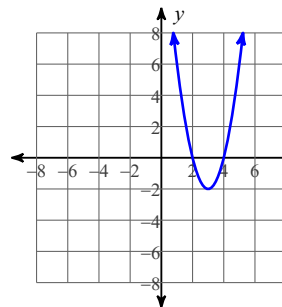
Vertex: $(0, 0)$
Axis of Sym.: $x = 0$
Opens: Up
Min value = 0
y-int: 0
x-int: 0

9)



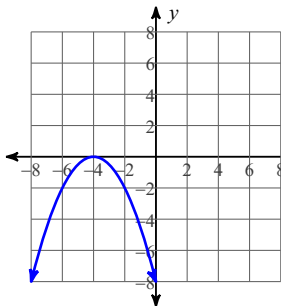
Vertex: $(3, 1)$
Axis of Sym.: $x = 3$
Opens: Down
Max value = 1
y-int: -8
x-int: 4 and 2

10)



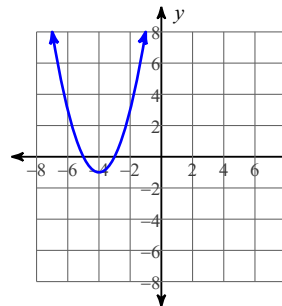
Vertex: $(3, -2)$
Axis of Sym.: $x = 3$
Opens: Up
Min value = -2
y-int: 16
x-int: 4 and 2

11)



Vertex: $(-4, 0)$
Axis of Sym.: $x = -4$
Opens: Down
Max value = 0
y-int: -8
x-int: -4

12)



Vertex: $(-4, -1)$
Axis of Sym.: $x = -4$
Opens: Up
Min value = -1
y-int: 15
x-int: -5 and -3

13) $\{-5, 0\}$

14) $\{2, 6\}$

15) $\{-\frac{8}{5}, -8\}$

16) $\{\frac{5}{2}, 8\}$

17) $\{6\sqrt{2}, -6\sqrt{2}\}$

18) $\{\frac{i\sqrt{274}}{4}, -\frac{i\sqrt{274}}{4}\}$

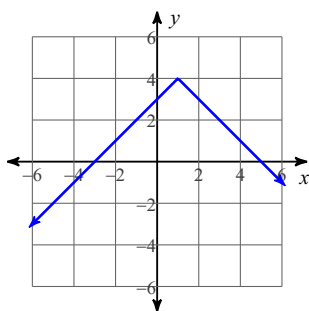
19) $\{13, 7\}$

20) $\left\{\frac{2 + \sqrt{10}}{2}, \frac{2 - \sqrt{10}}{2}\right\}$

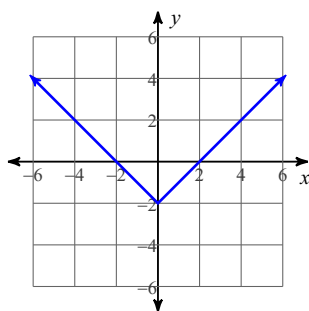
21) $\left\{\frac{-1 + i\sqrt{39}}{8}, \frac{-1 - i\sqrt{39}}{8}\right\}$

22) $\left\{-\frac{1}{4}, -1\right\}$

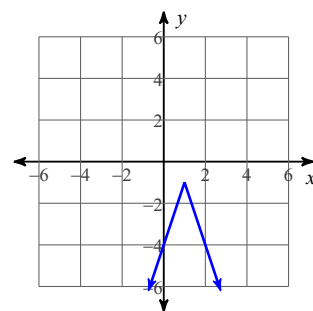
23)



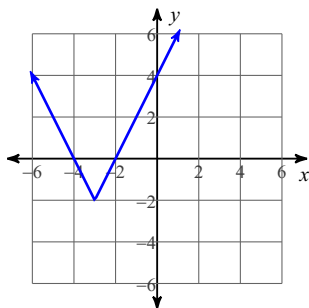
24)



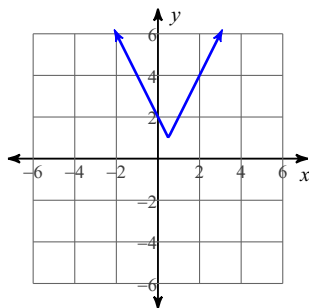
25)



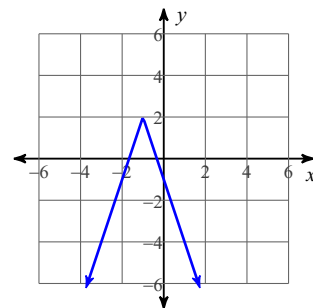
26)



27)



28)



29) $\{6, -6\}$

30) $\{14, 4\}$

31) $\{-6\}$

32) No solution.

33) $n > 9$ or $n < -9$

34) No solution.

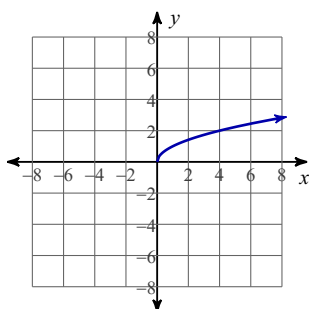
35) $\{\text{All real numbers.}\}$

36) $x \geq 9$ or $x \leq -3$

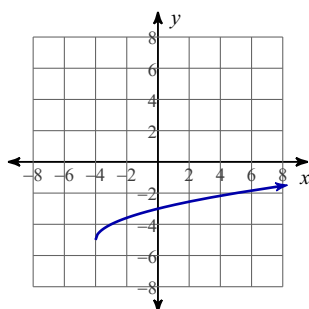
37) $-7 \leq x \leq 5$

38) $-21 \leq n \leq 9$

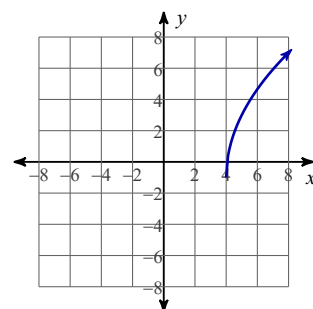
39)



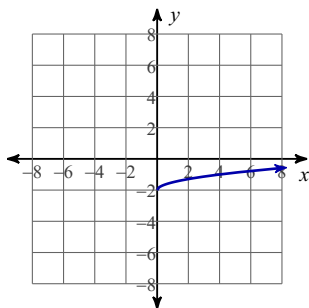
40)



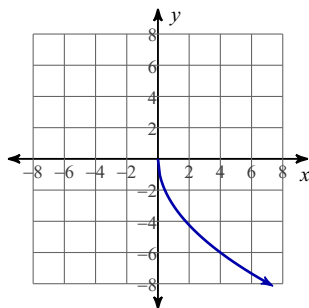
41)



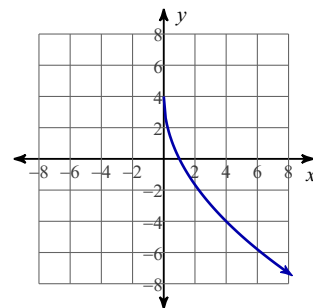
42)



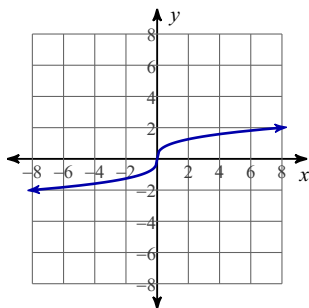
43)



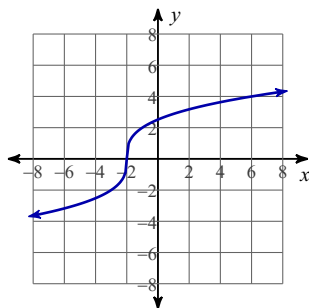
44)



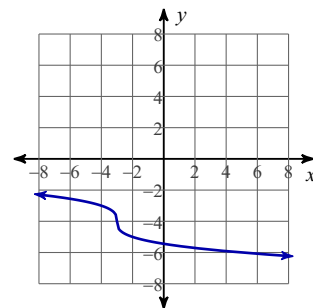
45)



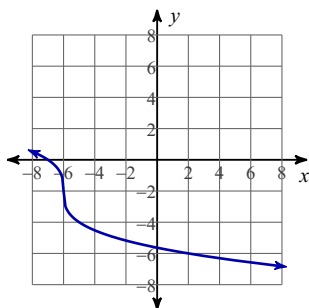
46)



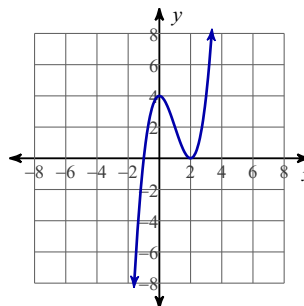
47)



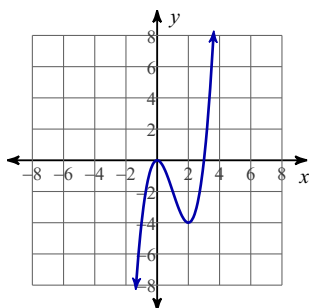
48)

49) $\{-10\}$ 50) $\{4\}$ 51) $\{9\}$ 52) $\{-8\}$ 53) $\{13\}$ 54) $\{27\}$ 55) $\{-4\}$ 56) $\{-8\}$ 57) $\{-29, 99\}$ 58) $\{8\}$ 59) $\{21\}$ 60) $\{45\}$

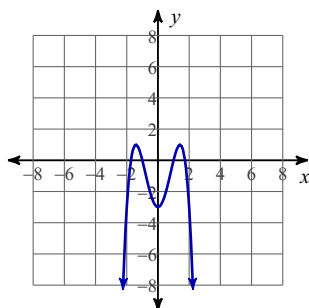
61)



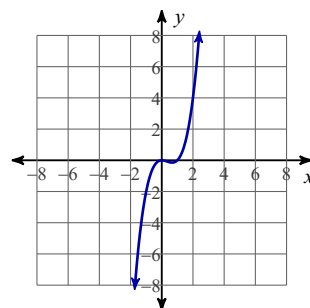
62)



63)

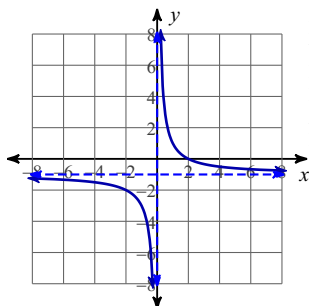


64)

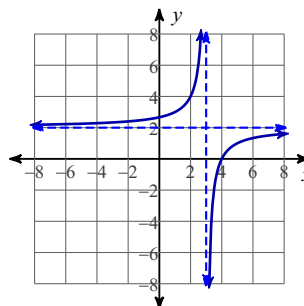
65) $\left\{-3, \frac{3+3i\sqrt{3}}{2}, \frac{3-3i\sqrt{3}}{2}\right\}$ 66) $\{i\sqrt{6}, -i\sqrt{6}, 1, -1\}$ 67) $\{0, 1, 5\}$ 68) $\{2i, -2i, 2, -2\}$ 69) $\{13, -1 \text{ mult. } 2\}$ 70) $\{0, -7, 1, -1\}$

71)

72)

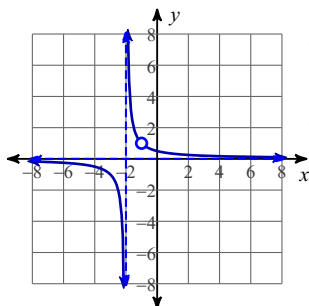


Discontinuities: 0
Vertical Asym.: $x = 0$
Holes: None
Horz. Asym.: $y = -1$
X-intercepts: 2
Domain:
All reals except 0



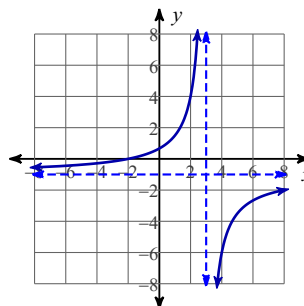
Discontinuities: 3
Vertical Asym.: $x = 3$
Holes: None
Horz. Asym.: $y = 2$
X-intercepts: 4
Domain:
All reals except 3

73)



Discontinuities: $-2, -1$
Vertical Asym.: $x = -2$
Holes: $x = -1$
Horz. Asym.: $y = 0$
X-intercepts: None
Domain:
All reals except $-2, -1$

74)



Discontinuities: 3
Vertical Asym.: $x = 3$
Holes: None
Horz. Asym.: $y = -1$
X-intercepts: -2
Domain:
All reals except 3

75) $\left\{-\frac{3}{5}\right\}$ 76) $\left\{\frac{2}{5}\right\}$ 77) $\{-1, 1\}$ 78) $\left\{5, -\frac{3}{2}\right\}$

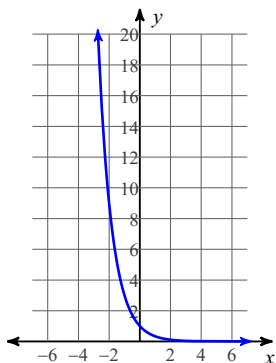
79) $\left\{2, -\frac{3}{4}\right\}$

80) $\{3\}$

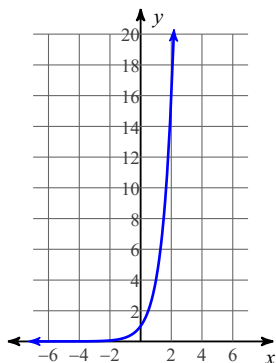
81) $\{0\}$

82) $\left\{1, -\frac{4}{3}\right\}$

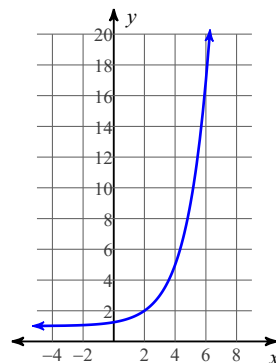
83)



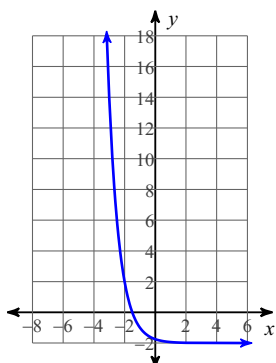
84)



85)



86)



87) $\left\{-\frac{3}{4}\right\}$

88) $\left\{\frac{12}{13}\right\}$

89) $\left\{-\frac{4}{5}\right\}$

90) $\left\{-\frac{3}{8}\right\}$

91) $\{0\}$

92) $\left\{-\frac{6}{5}\right\}$

93) $\frac{\log 57}{9}$

94) $\log \frac{57}{2}$

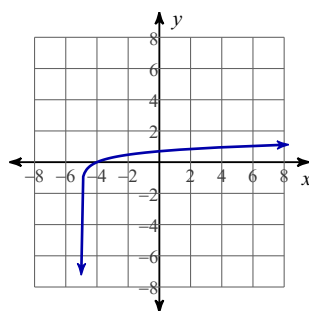
95) $\frac{\ln \frac{81}{8}}{9}$

96) $\ln \frac{33}{10} + 10$

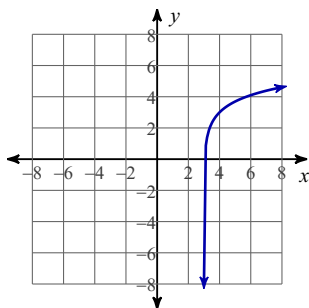
97) $\frac{-\log_{19} 44 - 4}{2}$

98) $-\log_2 \frac{49}{3} - 6$

99)



100)



101) -2

102) 2

103) 2

104) 0

105) -1

106) 4

107) 0

108) 3

109) $\{7, -7\}$

110) $\{135\}$

111) $\left\{\frac{e^4}{7}\right\}$

112) $\{e^2 + 10\}$

113) $\left\{\frac{e^3 - 35}{7}\right\}$

114) $\{100, -100\}$

115) $\left\{\frac{5}{8}\right\}$

119) $4x^9y$

123) $-2\sqrt[3]{6n^2}$

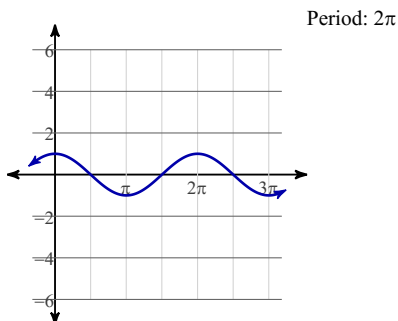
127) $7|y|\sqrt{3xy}$

131) $-12x\sqrt[3]{4x^2}$

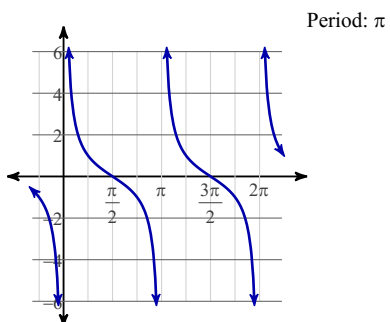
135) $\frac{2\sqrt{5y}}{5x}$

138) $\frac{12\sqrt{2x} + 3x\sqrt{6x}}{16x - 3x^3}$

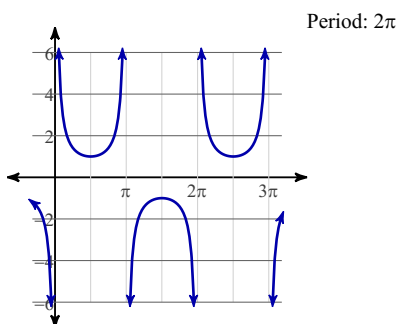
141)



143)



145)



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

151) -1

155) 0

159) $\frac{6}{7}$

163) $\frac{2y + 3x}{2x}$

116) $\left\{\frac{e}{4}, -\frac{e}{4}\right\}$

120) $8y^{11}x^9$

124) $3|r|\sqrt[4]{3}$

128) $2|m|\sqrt{3n}$

132) $2x^2\sqrt{30x}$

136) $\frac{\sqrt{6}}{3x}$

139) $\frac{15x + 3\sqrt{2x}}{25x^2 - 2x}$

142)

117) $\frac{x^{15}y^4}{8}$

121) $-3a^2\sqrt[3]{3}$

125) $5|n|\sqrt{3mn}$

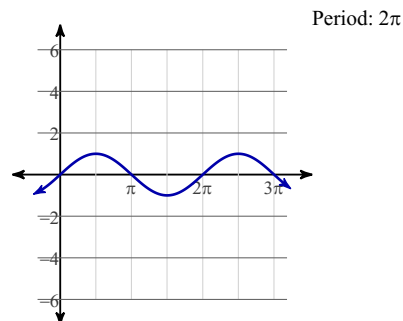
129) $3\sqrt[3]{6}$

133) $4\sqrt{6} + 6$

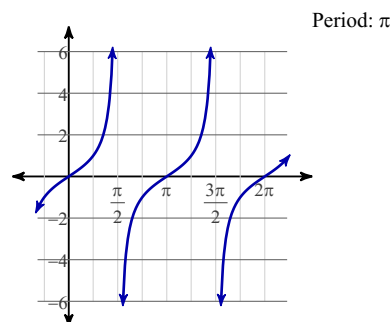
137) $\frac{\sqrt[3]{4x^2} + \sqrt[3]{2}}{6}$

140) $\frac{-16x - 4\sqrt{x}}{16x - 1}$

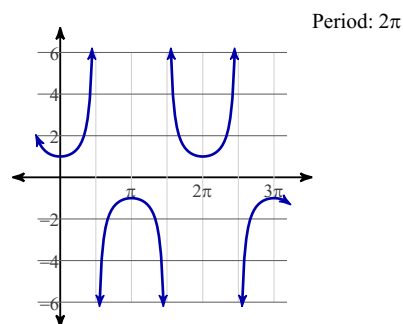
142)



144)



146)



149) $\frac{1}{2}$

153) $-\frac{2\sqrt{3}}{3}$

157) 0

161) $\frac{9\sqrt{10}}{20}$

165) $\frac{7x^2 + 4x}{3(x+4)(x+2)}$

118) $\frac{y^{24}}{x^3}$

122) $5|x|\sqrt{3x}$

126) $12|x| \cdot |y|\sqrt{x}$

130) $8\sqrt{2} + 3\sqrt{3}$

134) $-8\sqrt{5} + 32\sqrt{15}$

140)

142)

144)

146)

150) -2

154) $-\frac{2\sqrt{3}}{3}$

158) $-\sqrt{2}$

162) $\frac{17}{15}$

166) $\frac{2r^2 - 5r - 18}{2r(r+6)}$

$$\begin{array}{lll}
167) -\frac{3}{x+10}; \left\{10, -10, -\frac{4}{3}\right\} & 168) 9; \{-4, -6\} & 169) \frac{r-2}{9(r-9)}; \{0, 9, -3\} \\
170) \frac{-x-6}{7(x-9)}; \{9, 8, 2\} & 171) \frac{m^2+25}{25m^2} & 172) \frac{x^3}{3x-9} \\
174) \frac{2-m}{2mn+8m} & 175) -1-9i & 173) \frac{8-x^2y}{2y^2x^2} \\
178) \frac{9-10i}{181} & 179) \frac{4i-4}{7} & 176) 24+77i \\
& & 177) -144-144i \\
& & 180) \frac{5-i}{12}
\end{array}$$

Part II

Answer Key

Testname:

- 1) width 14 m, length 25 m
- 2) 5 inches
- 3) 5.1 s
- 4) 13 s
- 5) 1 in.
- 6) \$38,000
- 7) 18.7%
- 8) 5.13 hours
- 9) 351 miles
- 10) 30 ounces
- 11) \$4000 at 6%; \$12,000 at 7%
- 12) 607
- 13) 6.3 mph
- 14) 112 mph
- 15) 42 mph and 53 mph
- 16) -1.14, -0.63
- 17) $x = 0.59$
- 18) 1.26
- 19) $x = -5.11$ or $x = -0.39$
- 20) $y = 1.03x - 2.18$
- 21) $x = 18$, $y = -4$; (18, -4)