

Term 1 Final Review Project

List all sets to which the number belongs.

1) 0.11111...

C R Q

2) $6 + \sqrt{-4}$

C

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

C R Q Z W N

4) $\sqrt{-7}$

C I

Determine if the result of each situation will be rational or irrational. Give examples to support your answer.

5) Sum of a rational and an irrational number

Irrational

6) Sum of two rational numbers

Rational

7) Product of two irrational numbers

Rational or irrational

8) Product of two rational numbers

Rational

9) Sum of two irrational numbers

Rational or irrational

10) Product of a rational and an irrational number

Irrational

Write each expression in exponential form.

11) $(\sqrt{n})^3$

 $n^{\frac{3}{2}}$

12) $\sqrt[4]{m}$

 $m^{\frac{1}{4}}$

Write each expression in radical form.

$$13) m^{\frac{1}{3}}$$
$$\sqrt[3]{m}$$

$$14) (5b)^{\frac{1}{4}}$$
$$\sqrt[4]{5b}$$

Simplify. Your answer should contain only positive exponents.

$$15) 2x^2y^4 \cdot (y^{-2})^{-1}$$
$$2x^2y^6$$

$$16) (2x^{-3}y^{-4})^3 \cdot (2x^3y^4)^2$$
$$\frac{32}{x^3y^4}$$

$$17) \frac{b^3}{4ab^2 \cdot 4a^4b^3}$$
$$\frac{1}{16a^5b^2}$$

$$18) \frac{x^2y^2}{4x^{-4}y^2 \cdot 2x^3y^{-1}}$$
$$\frac{x^3y}{8}$$

$$19) \frac{2m^2n^2}{(m^{-4}n^2)^2}$$
$$\frac{2m^{10}}{n^2}$$

$$20) \frac{(a^4b^{-2})^{-3}}{a^4b^{-1}}$$
$$\frac{b^7}{a^{16}}$$

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$21) \left(x^{\frac{5}{4}} y^{-1} \cdot \left(x^{\frac{1}{4}} \right)^{\frac{5}{3}} \right)^2$$
$$\frac{x^{\frac{10}{3}}}{y^2}$$

$$22) xy^{\frac{4}{3}} \cdot (x^2)^{-\frac{3}{2}}$$
$$\frac{y^{\frac{4}{3}}}{x^2}$$

$$23) \frac{3a^{\frac{3}{4}} b^{\frac{2}{3}} \cdot 4a^{\frac{3}{4}} b^4}{4b^2}$$
$$3a^{\frac{3}{2}} b^{\frac{8}{3}}$$

$$24) \frac{4u^2 v^{-\frac{1}{2}}}{3u^2 v^{-1} \cdot 4u^{\frac{5}{3}} v^{\frac{3}{2}}}$$
$$\frac{1}{3u^{\frac{5}{3}} \cdot v}$$

$$25) \left(\frac{\left(x^{\frac{2}{3}} y^{-\frac{3}{4}} \right)^2}{(x^0 y^{-1})^{\frac{1}{2}}} \right)^2$$
$$\frac{x^{\frac{8}{3}}}{y^2}$$

$$26) \left(\frac{x^{-\frac{1}{2}}}{x^0 y^{\frac{1}{2}}} \right)^2$$
$$\frac{1}{xy}$$

$$27) \sqrt{8a^3 b^3}$$
$$2|a| \cdot |b| \sqrt{2ab}$$

$$28) \sqrt[3]{-54x^4 y^7}$$
$$-3xy^2 \sqrt[3]{2xy}$$

$$29) \sqrt{245x^2y^2}$$
$$7|x| \cdot |y| \sqrt{5}$$

$$30) \sqrt{16x^3y^4}$$
$$4y^2|x| \sqrt{x}$$

Simplify.

$$31) -2\sqrt{8} - 2\sqrt{2} - 3\sqrt{12} - \sqrt{8}$$
$$-8\sqrt{2} - 6\sqrt{3}$$

$$32) 2\sqrt{20a} \cdot -1\sqrt{5a^2}$$
$$-20|a| \sqrt{a}$$

$$33) (1 - 5\sqrt{3})(3 + \sqrt{3})$$
$$-12 - 14\sqrt{3}$$

$$34) (\sqrt{5} - 2)(4\sqrt{5} + 4)$$
$$12 - 4\sqrt{5}$$

$$35) \frac{\sqrt{3}}{3\sqrt{75}}$$
$$\frac{1}{15}$$

$$36) \frac{2\sqrt{4}}{\sqrt{5}}$$
$$\frac{4\sqrt{5}}{5}$$

$$37) \frac{4}{5 - \sqrt{2}}$$
$$\frac{20 + 4\sqrt{2}}{23}$$

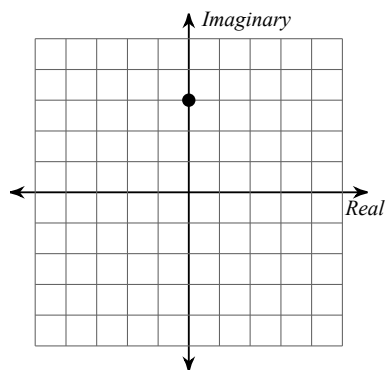
$$38) \frac{4}{4 - 5\sqrt{2}}$$
$$\frac{-8 - 10\sqrt{2}}{17}$$

$$39) \frac{-3 + \sqrt{5}}{2\sqrt{5} - \sqrt{3}}$$

$$\frac{-6\sqrt{5} - 3\sqrt{3} + 10 + \sqrt{15}}{17}$$

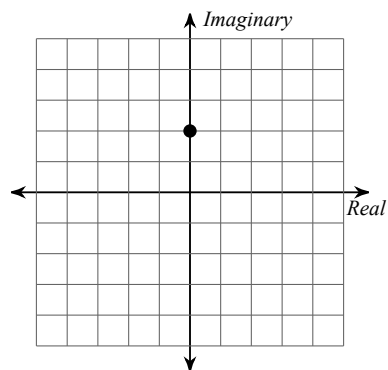
Identify each complex number graphed.

40)



$3i$

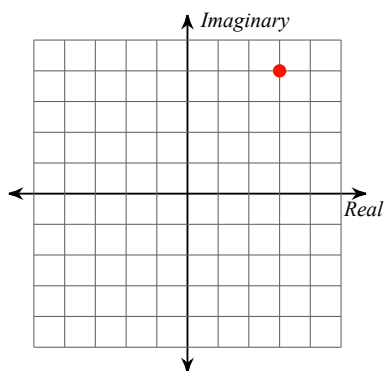
41)



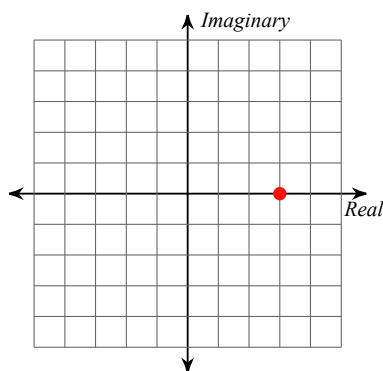
$2i$

Graph each number in the complex plane.

42) $3 + 4i$



43) 3



Simplify.

$$44) (-3 - 4i) + (-7 + 2i)$$

$$-10 - 2i$$

$$45) (-8 + 7i) - (2 - 7i)$$

$$-10 + 14i$$

$$46) (-2 - 7i)(3 - 7i)$$
$$-55 - 7i$$

$$47) (-6 + 8i)(-4 + 3i)$$
$$-50i$$

$$48) \frac{6}{-8i}$$
$$\frac{3i}{4}$$

$$49) -\frac{4}{9i}$$
$$\frac{4i}{9}$$

$$50) \frac{-10 - 3i}{-4i}$$
$$\frac{-10i + 3}{4}$$

$$51) \frac{1 + 9i}{1 + 6i}$$
$$\frac{55 + 3i}{37}$$

$$52) \frac{-5 - 3i}{1 + 4i}$$
$$-1 + i$$

$$53) \frac{4i}{-1 + 10i}$$
$$\frac{-4i + 40}{101}$$

54) What is a conjugate? Where does it come from? In what situations do you need to use a conjugate?

A conjugate is when you switch the middle sign of a binomial. It comes from \pm square root. You can use it to cancel out roots or imaginary numbers in a denominator.

55) Define a complex number. Why is every number a complex number?

A complex number is a real part and an imaginary part ($a+bi$). Every number is complex because either the real or imaginary part can be 0. Ex: $5=5+0i$

56) What does a rational exponent represent? Give an example.

A rational exponent represents a root. Ex: $x^{\frac{2}{3}} = \sqrt[3]{x^2}$

57) Explain why anything to the 0 power equals 1 (zero exponent property).

58) Show, using rational exponents, why $\sqrt[3]{12} \cdot \sqrt[3]{4} = \sqrt[3]{48}$.

Solve each equation by factoring.

59) $p^2 - 8p = 0$

$\{8, 0\}$

60) $x^2 + 5x = 0$

$\{-5, 0\}$

61) $v^2 - 12 = 4$

$\{-4, 4\}$

62) $x^2 + 7x + 3 = -7$

$\{-5, -2\}$

63) $r^2 - 8r + 15 = 0$

$\{3, 5\}$

64) $n^2 + n = 0$

$\{-1, 0\}$

$$65) 5n^2 - 40n + 43 = 8$$

$$\{7, 1\}$$

$$66) 4x^2 + 12x - 8 = -8$$

$$\{-3, 0\}$$

$$67) 10x^2 + 34x - 24 = 0$$

$$\left\{\frac{3}{5}, -4\right\}$$

$$68) 20k^2 - 84k + 72 = 0$$

$$\left\{\frac{6}{5}, 3\right\}$$

$$69) 9n^2 - 21n - 120 = 0$$

$$\left\{-\frac{8}{3}, 5\right\}$$

$$70) 8x^2 + 12x - 56 = 0$$

$$\left\{-\frac{7}{2}, 2\right\}$$

Factor each expression.

$$71) 4n^2 - 4$$

$$4(n+1)(n-1)$$

$$72) 16x^2 - 25$$

$$(4x+5)(4x-5)$$

$$73) 16x^2 - 1$$

$$(4x+1)(4x-1)$$

$$74) 4p^2 + 1$$

$$(2p+i)(2p-i)$$

$$75) 16b^2 + 36$$

$$4(2b+3i)(2b-3i)$$

$$76) 25b^2 + 4$$

$$(5b+2i)(5b-2i)$$

Solve each equation by completing the square.

77) $k^2 + 16k - 37 = 0$

$$\{-8 + \sqrt{101}, -8 - \sqrt{101}\}$$

78) $b^2 - 2b - 63 = 0$

$$\{9, -7\}$$

79) $m^2 - 6m + 49 = 10$

$$\{3 + i\sqrt{30}, 3 - i\sqrt{30}\}$$

80) $n^2 - 4n + 8 = 7$

$$\{2 + \sqrt{3}, 2 - \sqrt{3}\}$$

Solve each equation with the quadratic formula.

81) $4r^2 = -11r + 119$

$$\left\{\frac{17}{4}, -7\right\}$$

82) $2x^2 - 20 = -2x$

$$\left\{\frac{-1 + \sqrt{41}}{2}, \frac{-1 - \sqrt{41}}{2}\right\}$$

83) $12a^2 + 11 = 9a$

$$\left\{\frac{9 + i\sqrt{447}}{24}, \frac{9 - i\sqrt{447}}{24}\right\}$$

84) $10n^2 = -10 + 7n$

$$\left\{\frac{7 + 3i\sqrt{39}}{20}, \frac{7 - 3i\sqrt{39}}{20}\right\}$$

Solve each equation by taking square roots.

85) $36k^2 + 6 = 42$

$$\{1, -1\}$$

86) $9 + 25x^2 = 73$ $\left\{\frac{8}{5}, -\frac{8}{5}\right\}$

$$87) 2(x + 7)^2 = 20$$
$$-7 \pm \sqrt{10}$$

$$88) (x - 6)^2 - 4 = 44$$
$$6 \pm 4\sqrt{3}$$

89) Define the zero product property.

90) What is the Fundamental Theorem of Algebra? How can it be helpful?

91) What is the difference between factoring and solving by factoring? How do you know when you should do each? Give an example of factoring and solving by factoring to help your explanation.

92) Describe the best time to use each method. Give an example problem to support your description (you do not have to solve the problem). Examples cannot be questions that are already on the review.

a. Factoring

d. Taking a square root

c. Complete the square

d. Quadratic formula

93) What is the growth rate of a parabola?

94) How do you graph a parabola (regardless of what form it's in)?

95) What do the x-intercepts of a graph represent?

96) Draw an example of a quadratic that has imaginary solutions.

97) Give the equation for each form. Then describe what each letter in the form represents.

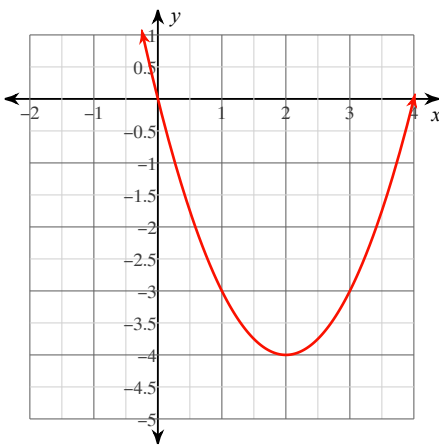
a. Vertex form

b. Intercept form

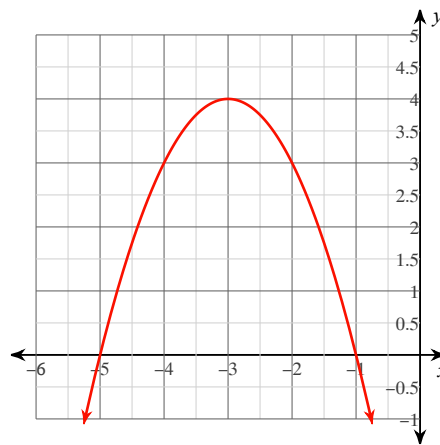
c. Standard form

Graph each quadratic.

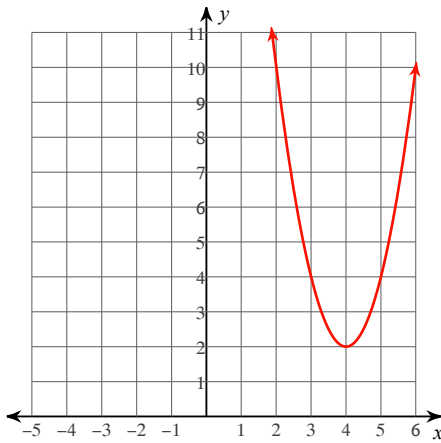
98) $y = x^2 - 4x$



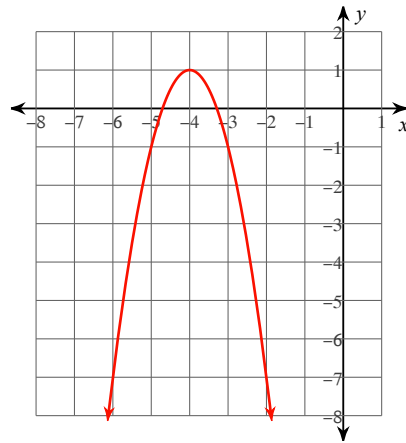
99) $y = -x^2 - 6x - 5$



100) $y = 2x^2 - 16x + 34$

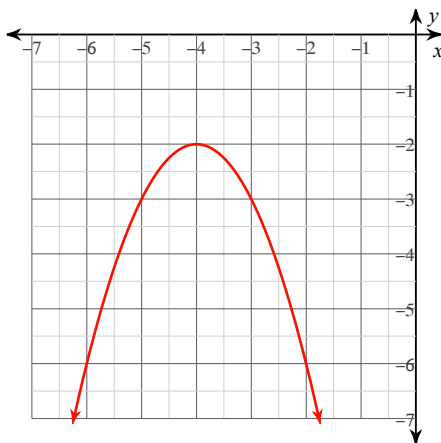


101) $y = -2x^2 - 16x - 31$



Sketch the graph of each function. Identify the key features when asked.

102) $y = -x^2 - 8x - 18$



103) a. x-intercept(s):

a. None

b. y-intercept:

b. $(0, -18)$

c. axis of symmetry:

c. $x = -4$

d. vertex:

d. $(-4, -2)$

e. Max/Min Value:

e. Max, -2

f. Domain:

f. $(-\infty, \infty)$

g. Range:

g. $(-\infty, -2]$

h. Increasing:

h. $(-\infty, -4)$

i. Decreasing:

i. $(-4, \infty)$

j. Direction of Opening:

j. Down

k. Positive:

k. None

l. Negative:

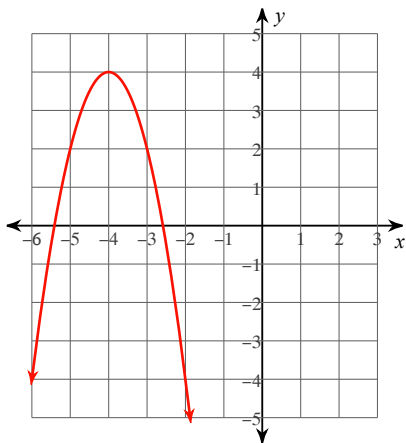
l. $(-\infty, \infty)$

m. End behavior:

m. As $x \rightarrow -\infty$, $y \rightarrow -\infty$

As $x \rightarrow \infty$, $y \rightarrow -\infty$

104) $y = -2x^2 - 16x - 28$



105) a. x-intercept(s):

a. $(-5.5, 0), (-3.5, 0)$

b. y-intercept:

b. $(0, -28)$

c. axis of symmetry:

c. $x = -4$

d. vertex:

d. $(-4, 4)$

e. Max/Min Value:

e. Max, 4

f. Domain:

f. $(-\infty, \infty)$

g. Range:

g. $(-\infty, 4]$

h. Increasing:

h. $(-\infty, -4)$

i. Decreasing:

i. $(-4, \infty)$

j. Direction of Opening:

j. Down

k. Positive:

k. $(-5.5, -3.5)$

l. Negative:

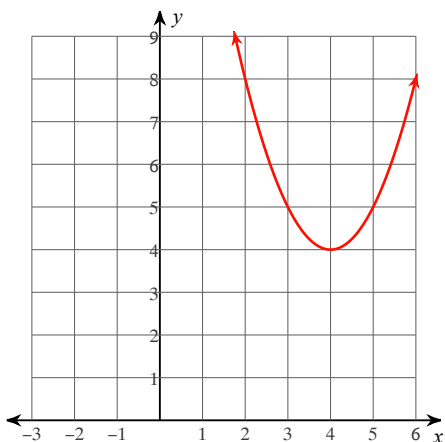
l. $(-\infty, -5.5) \cup (-3.5, \infty)$

m. End behavior:

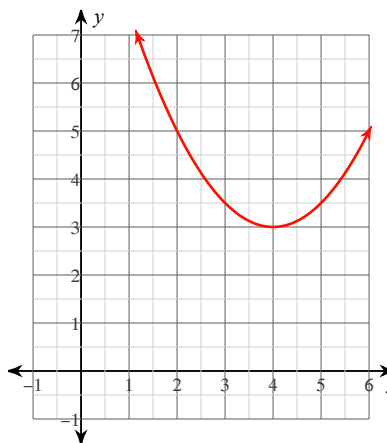
m. As $x \rightarrow -\infty, y \rightarrow -\infty$

As $x \rightarrow \infty, y \rightarrow -\infty$

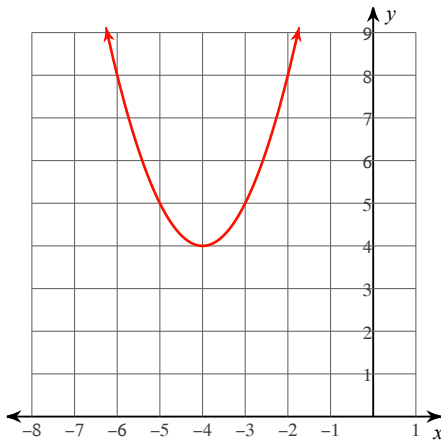
106) $y = (x - 4)^2 + 4$



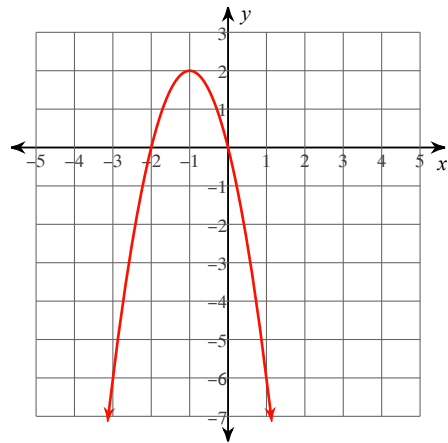
107) $y = \frac{1}{2}(x - 4)^2 + 3$



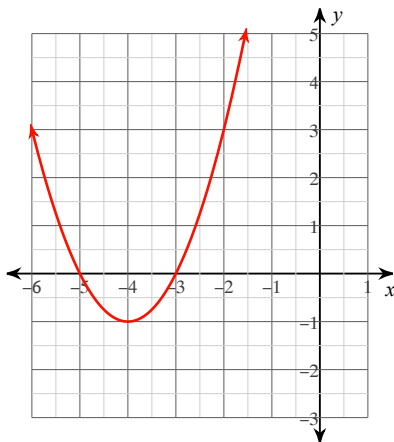
108) $y = (x + 4)^2 + 4$



109) $y = -2(x + 1)^2 + 2$

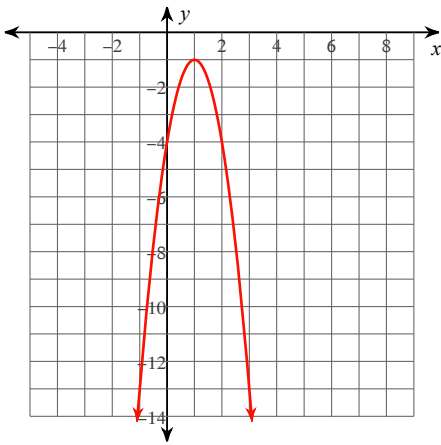


110) $f(x) = (x + 4)^2 - 1$



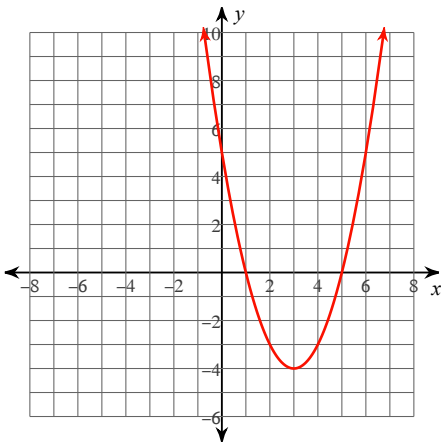
- 111) a. x-intercept(s): a. $(-5, 0), (-3, 0)$
 b. $(0, 15)$
 b. y-intercept: c. $x = -4$
 d. $(-4, -1)$
 c. axis of symmetry: e. Min, -1
 f. $(-\infty, \infty)$
 d. vertex: g. $[-1, \infty)$
 h. $(-4, \infty)$
 e. Max/Min Value: i. $(-\infty, -4)$
 j. Up
 f. Domain: k. $(-\infty, -5) \cup (-3, \infty)$
 l. $(-5, -3)$
 g. Range: m. As $x \rightarrow -\infty, y \rightarrow \infty$
 As $x \rightarrow \infty, y \rightarrow \infty$
 h. Increasing:
 i. Decreasing:
 j. Direction of Opening:
 k. Positive:
 l. Negative:
 m. End behavior:

112) $f(x) = -3(x - 1)^2 - 1$

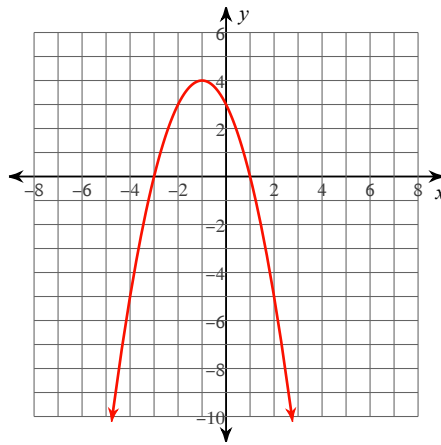


- 113) a. x-intercept(s):
 b. y-intercept:
 c. axis of symmetry:
 d. vertex:
 e. Max/Min Value:
 f. Domain:
 g. Range:
 h. Increasing:
 i. Decreasing:
 j. Direction of Opening:
 k. Positive:
 l. Negative:
 m. End behavior:
- a. None
 b. (0, -4)
 c. $x = 1$
 d. (1, -1)
 e. Max, -1
 f. $(-\infty, \infty)$
 g. $(-\infty, -1]$
 h. $(-\infty, 1)$
 i. (1, ∞)
 j. Up
 k. None
 l. $(-\infty, \infty)$
 m. As $x \rightarrow -\infty, y \rightarrow -\infty$
 As $x \rightarrow \infty, y \rightarrow -\infty$

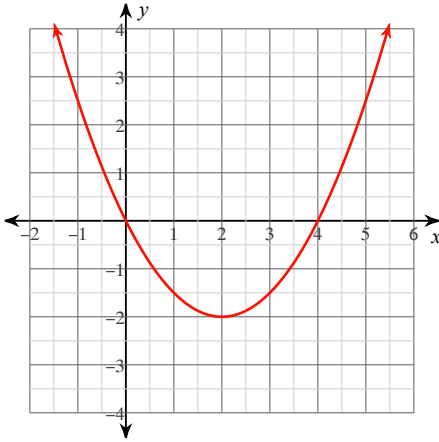
114) $y = (x - 5)(x - 1)$



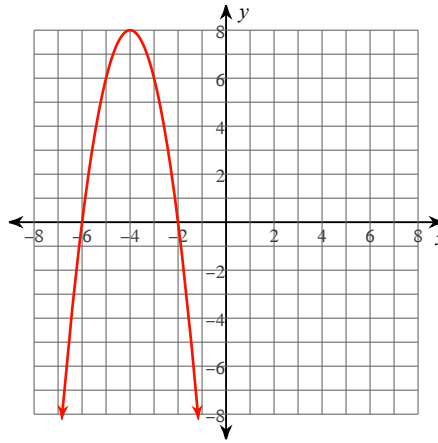
115) $y = -(x + 3)(x - 1)$



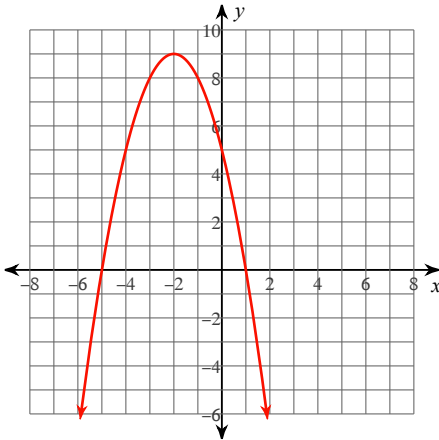
116) $y = \frac{1}{2}x(x - 4)$



117) $f(x) = -2(x + 6)(x + 2)$



118) $f(x) = -(x - 1)(x + 5)$



119) a. x-intercept(s):

a. $(-5, 0), (1, 0)$

b. y-intercept:

b. $(0, 5)$

c. axis of symmetry:

c. $x = -2$

d. vertex:

d. $(-2, 9)$

e. Max/Min Value:

e. Max, 9

f. Domain:

f. $(-\infty, \infty)$

g. Range:

g. $(-\infty, 9]$

h. Increasing:

h. $(-\infty, -2)$

i. Decreasing:

i. $(-2, \infty)$

j. Direction of Opening:

j. Down

k. Positive:

k. $(-5, 1)$

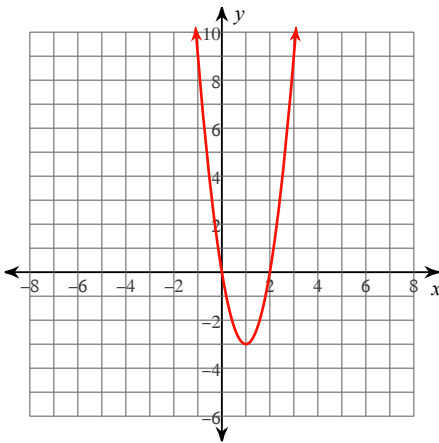
l. Negative:

l. $(-\infty, -5) \cup (1, \infty)$

m. End behavior:

m. As $x \rightarrow -\infty, f(x) \rightarrow -\infty$
As $x \rightarrow \infty, f(x) \rightarrow -\infty$

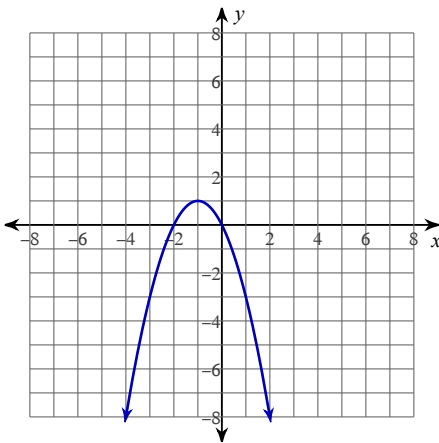
120) $f(x) = 3x(x - 2)$



- 121) a. x-intercept(s): a. $(0, 0), (2, 0)$
 b. y-intercept: b. $(0, 0)$
 c. axis of symmetry: c. $x = 1$
 d. vertex: d. $(1, -3)$
 e. Max/Min Value: e. Min, -3
 f. Domain: f. $(-\infty, \infty)$
 g. Range: g. $[-3, \infty)$
 h. Increasing: h. $(1, \infty)$
 i. Decreasing: i. $(-\infty, 1)$
 j. Direction of Opening: j. Up
 k. Positive: k. $(-\infty, 0) \cup (2, \infty)$
 l. Negative: l. $(0, 2)$
 m. End behavior: m. As $x \rightarrow -\infty, f(x) \rightarrow \infty$
 As $x \rightarrow \infty, f(x) \rightarrow \infty$

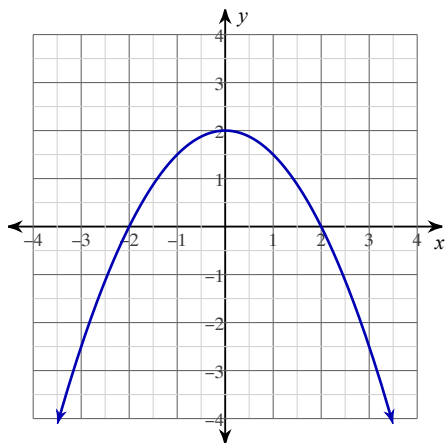
Write the equation of the graph in each form.

122)



- 123) a. Vertex form a. $y = -(x + 1)^2 + 1$
 b. Intercept form b. $y = -x(x + 2)$
 c. Standard form c. $y = -x^2 - 2x$
- b. Intercept form
- c. Standard form.

124)



125) a. Vertex form

$$a. y = \frac{1}{2}x^2 + 2$$

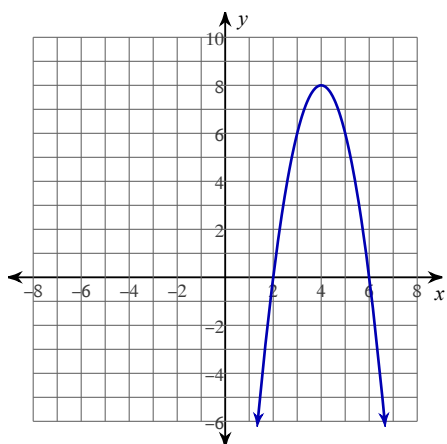
$$b. y = \frac{1}{2}(x + 2)(x - 2)$$

$$c. y = \frac{1}{2}x^2 + 2$$

b. Intercept form

c. Standard form.

126)



127) a. Vertex form

b. Intercept form

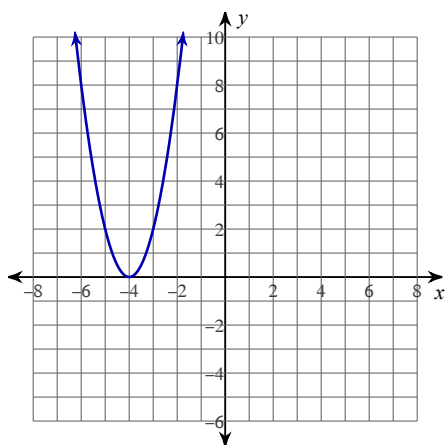
c. Standard form.

$$a. y = -2(x - 4)^2 + 8$$

$$b. y = -2(x - 2)(x - 6)$$

$$c. y = -2x^2 + 16x - 24$$

128)



129) a. Vertex form

$$a. y = 2(x + 4)^2$$

$$b. y = 2(x + 4)^2$$

$$c. y = 2x^2 + 16x + 32$$

b. Intercept form

c. Standard form.