

Function Junction Concepts and Practice

You should be able to:

- Transform a quadratic function and be able to write the new equation
- Write a quadratic equation in standard, factored, and vertex forms
- Solve quadratic equations by factoring, square root method, completing the square, and using the quadratic formula.
- Solve problems about objects in motion in a real life context by using one of the above strategies
- Use the discriminant to determine the number of solutions for a quadratic equation
- Explain the significance of the key features of a parabola in the context of a real life problem

Resources:

- FJ Investigation 3
- FJ Problems 4.1 - 4.3
- All class work notes, handouts, and ACE Questions.

Solve the equation by factoring.

$$11.) x^2 + 8x + 16 = 0$$

$$12.) x^2 - 3x - 10 = 0$$

$$13.) (2x + 3)(x - 6) = 0$$

$$14.) x^2 - 49 = 0$$

$$15.) x^2 - 45 = -12x$$

$$16.) 2x^2 + 11x + 5 = 0$$

$$17.) 4x^2 + 7x + 3 = 0$$

$$18.) 8x^2 + 2x - 15 = 0$$

23.) $y = x^2 + 6x - 16$

y-intercept:

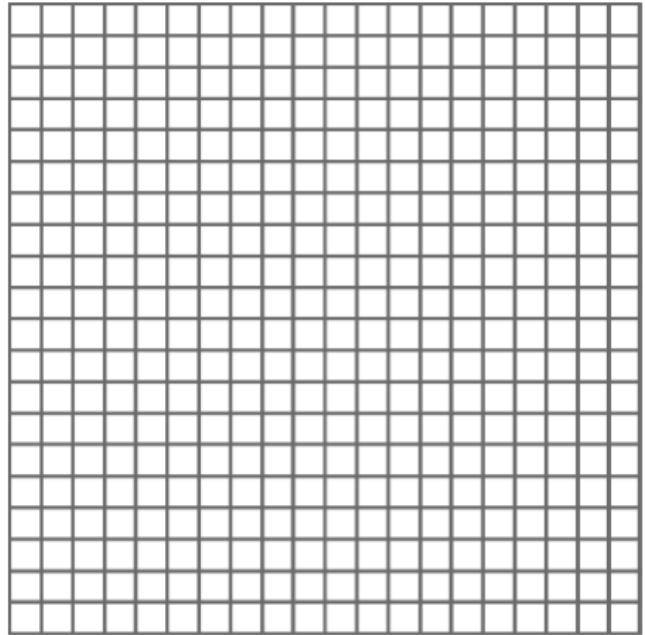
x-intercepts:

line of symmetry:

vertex:

up/down

additional point:



For questions 24-27, use the following information.

A stomp rocket is launched into the air from ground level. It's height h as a function of time t can be modeled by the equation $h = -16t^2 + 64t$.

24.) How high will the rocket be at 1.5 seconds?

25.) How long will it take for the rocket to hit the ground?

26.) When will the rocket reach its maximum height?

27.) The advertising on the package says "Can fly over 60 feet high!" Does this rocket exceed the height listed on the package?

44.) Abraham throws a ball from a point 40 m above the ground. The height of the ball from the ground level after 't' seconds is defined by the function $h(t) = 40t - 5t^2$. How long will the ball take to hit the ground?

45.) A rocket is launched into the air from ground level with an initial velocity of 120 feet per second.

a.) Write an equation that models how the height h of the rocket changes over time t .

b.) How long will it take for the rocket to hit the ground?

c.) The advertising on the package says "Can fly over 250 feet high!" Does this rocket exceed the height listed on the package?

d.) When is the rocket 160 feet off the ground?

46.) A rocket carrying fireworks is launched from a hill 80 feet above a lake. The rocket will fall into the lake after exploding at its maximum height. The rocket's height above the surface of the lake is given by $h = -16t^2 + 64t + 80$.

- a. What is the height of the rocket after 1.5 seconds?

- b. What is the maximum height reached by the rocket?

- c. How long will it take for the rocket to hit 128 feet?

- d. After how many seconds will the rocket hit the lake?

47.) After t seconds, a ball tossed in the air from the ground level reaches a height of H feet given by the equation $H(t) = 144t - 16t^2$.

- a. What is the height of the ball after 3 seconds?

- b. What is $H(4)$?

- c. What is the maximum height the ball will reach?

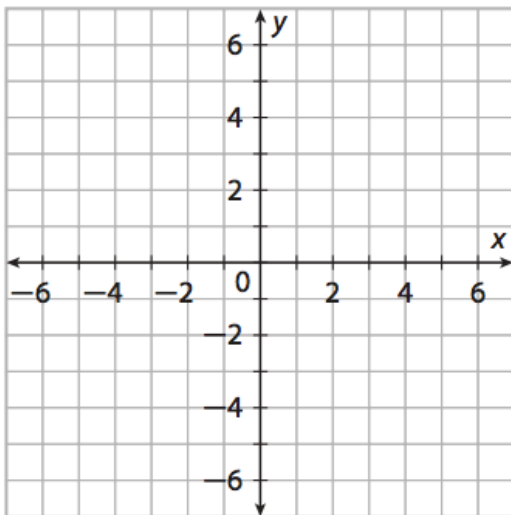
- d. Find the number of seconds the ball is in the air when it reaches a height of 224 feet.

94. How is the graph of $g(x) = (x + 12)^2$ related to the graph of $f(x) = x^2$?

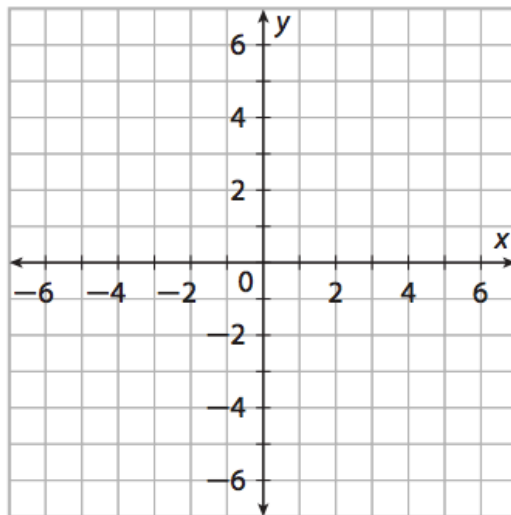
95. How is the graph of $g(x) = (x - 10)^2$ related to the graph of $f(x) = x^2$?

For #'s 96-99, graph the quadratic function. Give the minimum or maximum value and the line of symmetry.

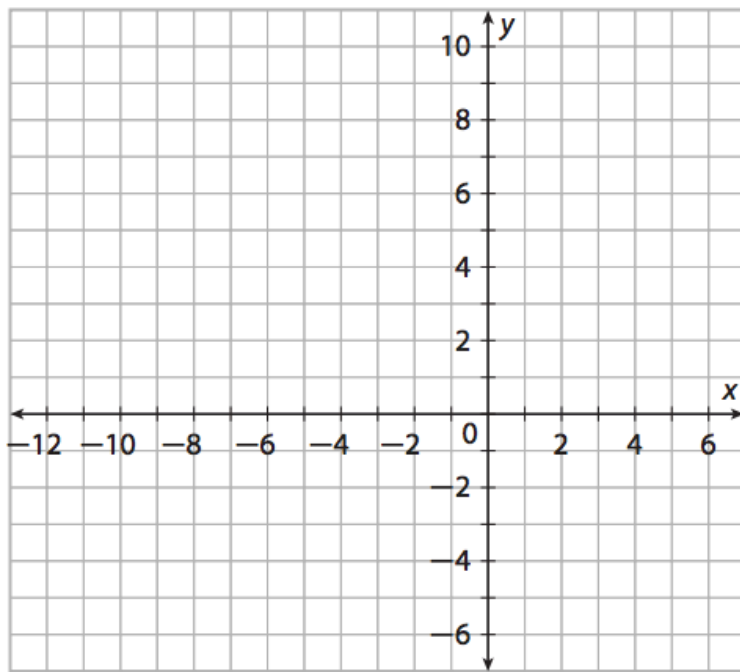
96. $g(x) = (x - 1)^2 - 5$



97. $g(x) = -(x + 2)^2 + 5$



98. $g(x) = -\frac{1}{3}(x + 3)^2 + 8$



Solve each equation by taking the square root.

100. $a^2 + 1 = 2$

101. $n^2 - 4 = 77$

102. $m^2 + 7 = 6$

103. $x^2 - 1 = 80$

104. $4x^2 - 6 = 74$

105. $3m^2 + 7 = 301$

106. $b^2 = -4b + 73$

107. $n^2 - 16n = 12$

Solve each equation by the method of your choice. All answers should be exact and simplified.

108. $6b^2 + 252 = -78b$

109. $v^2 = 1$

110. $2x = 4x^2 - 22$

111. $n^2 + 18n - 61 = 7$

112. $x^2 - 14 = 5x$

113. $0 = -3x^2 - 48 - 24x$

114. $n^2 - 10 = -20$

115. $x^2 = 35 + 12x$

116. $n^2 + 9n + 13 = -7$

117. $8r^2 + 12r = 21$

118. A football is punted into the air. Its height h , in meters, after t seconds is given by the equation $h = -4.9t^2 + 24.5t + 1$

a) How high is the ball after 1 second?

b) Find the maximum height of the ball to one decimal place

c) When does the ball reach its maximum height?

d) When does the ball hit the ground?

119. A stone is thrown skyward from the top of a building. The distance in ft between the stone and the ground in t seconds is given by the function $d = -16t^2 - 4t + 442$. How long after the stone is thrown is it 430 ft from the ground?

120. A rock is thrown from the top of a tall building. The distance, in feet, between the rock and the ground t seconds after it is thrown is given by $d = -16t^2 - 4t + 382$. How long after the rock is thrown is it 370 feet from the ground?

Find the discriminant of each quadratic equation then state the number of real and imaginary solutions.

121. $9n^2 - 3n - 8 = -10$

122. $-2x^2 - 8x - 14 = -6$

123. $9m^2 + 6m + 6 = 5$

124. $4a^2 = 8a - 4$