

Section 2.1

Quadratic Functions

Objective: Students will analyze graphs of quadratic functions and write quadratic functions given two of its ordered pairs.

Study Problems Chapter 2

Pg. 143 #12, 23, 33, 37, 44-45, 47, 57, 74,

Quadratic Function

A quadratic function is an even/2nd degree polynomial function of the form ax^2+bx+c whose graph is a parabola and contains an axis of Symmetry.

Let a , b , and c be real numbers with $a \neq 0$.

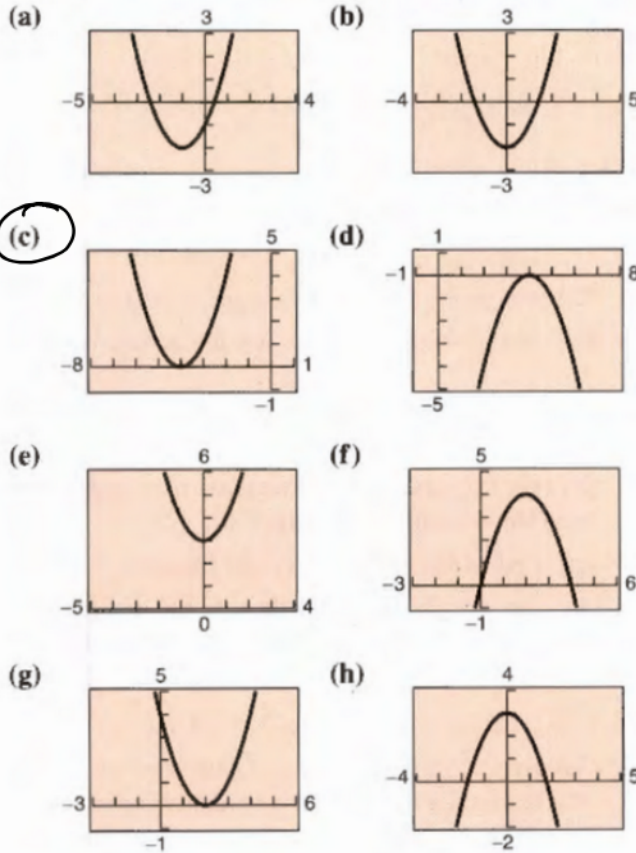
Forms of Quadratic

Standard Form — $y = ax^2 + bx + c$

Intercept Form — $y = (x-p)(x-q)$

Vertex Form — $y = a(x-h)^2 + k$

Match the graph with the function



2. $f(x) = (x + 4)^2$ C
 4. $f(x) = 3 - x^2$ H
 6. $f(x) = (x + 1)^2 - 2$ A
 8. $f(x) = -(x - 4)^2$ D

Write the equation of

Example

Graph the quadratic function, identify vertex and x-intercepts

$f(x) = -4x^2 + 8x + 6$

$f(x) = -4(x^2 - 2x + 1) + 6 + 4$

$f(x) = -4(x - 1)^2 + 10$

$V(1, 10)$ - vertex

Step Pattern $(1, 3, 5) \cdot a = -4, -12, -20$

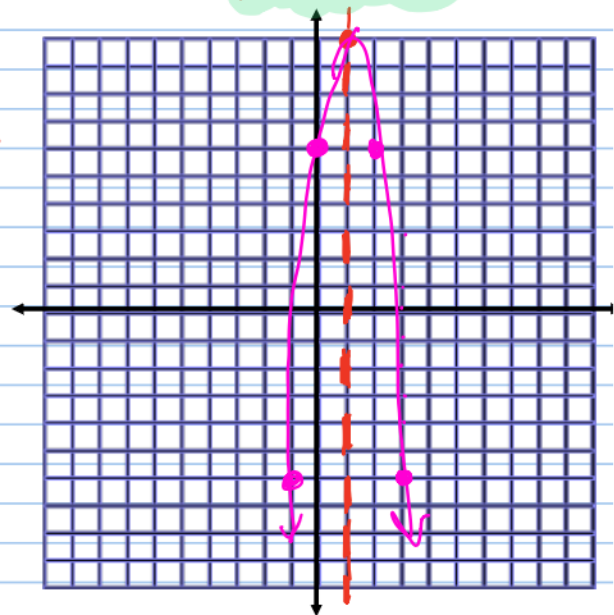
$0 = -4(x - 1)^2 + 10$

$-10 = -4(x - 1)^2$

$\pm \sqrt{2.5} = \sqrt{(x - 1)^2}$

$\pm 1.58 = x - 1$

$1.58 + 1 = x$ and $-1.58 + 1 = x$



$$x = 2.58 \quad x = -0.58$$

$x = \text{int}$

Error Analysis: A student found the vertex of $y=4x^2-16x+14$ by completing the square. Identify the error and correct it.

$$y=4x^2-16x+14$$

$$y=4(x^2-4x)+14$$

$$y=4(x^2-4x+4)+14+16$$

$$y=4(x-2)^2+30$$

vertex (2, 30)

Since a is positive the parabola

opens upward with a vertex of (2, 30)

Example

Find the quadratic equation that has a vertex at (1, -2) and passes through the point (3, 6).

step 1. Since the vertex is (1, -2), we know that the equation has the form

$$f(x) = a(x-1)^2 - 2.$$

step 2 To find a , we substitute the point (3, 6) and solve for a .

$$f(x) = a(x-1)^2 - 2$$

$$6 = a(3-1)^2 - 2$$

$$6 = 4a - 2$$

$$8 = 4a$$

$$2 = a$$

step 3.

Write the equation in standard form

$$f(x) = 2(x-1)^2 - 2.$$

Example

Find the quadratic that has a vertex at $(4, -1)$ and passes through the point $(2, 3)$.

$$f(x) = a(x-h)^2 + k$$

$$3 = a(2-4)^2 - 1$$

$$3 = a(-2)^2 - 1$$

$$\begin{array}{r} 3 = 4a - 1 \\ +1 \quad \quad +1 \\ \hline \end{array}$$

$$\frac{4}{4} = \frac{4a}{4}$$

$$a = 1$$

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

Example

Find two quadratic functions whose x intercepts are $(2.5, 0)$ and $(-4, 0)$

① $y = (x - 2.5)(x + 4)$

② $y = -(x - 2.5)(x + 4)$

