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4-1 Practice
Graphing Quadratic Functions

Axis of Symmetry

$x = \frac{-b}{2a}$

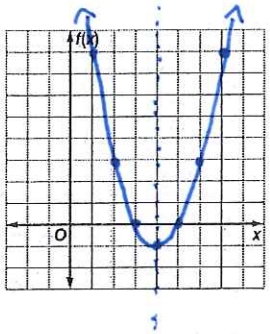
Complete parts a–c for each quadratic function.

a. Find the *y*-intercept, the equation of the axis of symmetry, and the *x*-coordinate of the vertex.
b. Make a table of values that includes the vertex.
c. Use this information to graph the function.

1. $f(x) = x^2 - 8x + 15$

$x = \frac{-(-8)}{2(1)} = \frac{8}{2} = 4$

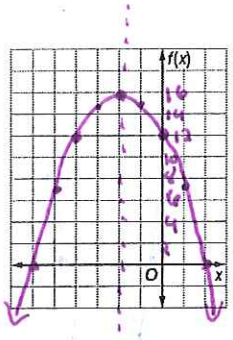
x	y
2	3
3	0
4	-1
5	0
6	3



2. $f(x) = -x^2 - 4x + 12$

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

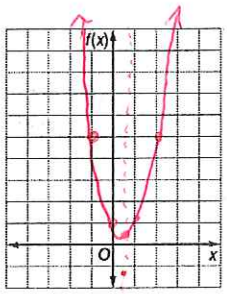
x	y
-4	12
-3	15
-2	16
-1	15
0	12



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

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

x	y
-1	5
0	1
½	½
1	1
2	5



Determine whether each function has a *maximum* or *minimum* value, and find that value. Then state the domain and range of the function.

4. $f(x) = x^2 + 2x - 8$ Minimum = -9

Domain: $(-\infty, \infty)$

Range: $[-9, \infty)$

5. $f(x) = x^2 - 6x + 14$ Minimum = 5

Domain: $(-\infty, \infty)$

Range: $[5, \infty)$

6. $v(x) = -x^2 + 14x - 57$ Maximum = -8

Domain: $(-\infty, \infty)$

Range: $(-\infty, -8]$

7. $f(x) = -x^2 + 4x - 1$ Maximum = 3

Domain: $(-\infty, \infty)$

Range: $(-\infty, 3]$

8. GRAVITATION From 4 feet above a swimming pool, Susan throws a ball upward with a velocity of 32 feet per second. The height $h(t)$ of the ball t seconds after Susan throws it is given by $h(t) = -16t^2 + 32t + 4$. For $t \geq 0$, find the maximum height reached by the ball and the time that this height is reached.

$x = \frac{-32}{2(-16)} = \frac{-32}{-32} = 1$

$h(1) = -16(1)^2 + 32(1) + 4$

$h(1) = -16 + 32 + 4$

$h(1) = 20$

Max Height = 20 feet

Time of Max Height = 1 second

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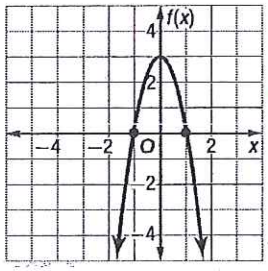
4-2 Practice
Solving Quadratic Equations By Graphing

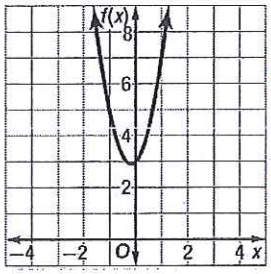
Use the related graph of each equation to determine its solutions.

1. $-3x^2 + 3 = 0$



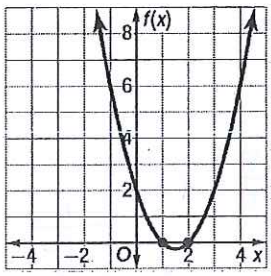
$x = -1$ and $x = 1$

2. $3x^2 + x + 3 = 0$



No Real Solutions

3. $x^2 - 3x + 2 = 0$

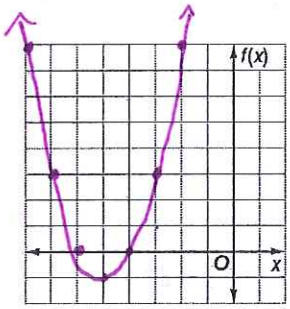


$x = 1$ and $x = 2$

Solve each equation. If exact roots cannot be found, state the consecutive integers between which the roots are located.

4. $x^2 + 10x + 24 = 0$

$x = \frac{-10}{2(1)} = \frac{-10}{2} = -5$

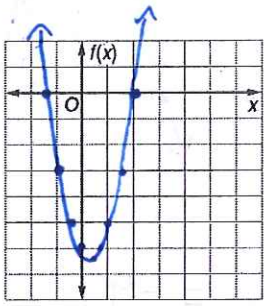


x	y
-8	8
-7	3
-6	0
-5	-1
-4	0
-3	3
-2	8

$x = -6$ and $x = -4$

5. $2x^2 - x - 6 = 0$

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

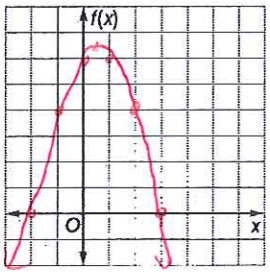


x	y
-1.5	0
-1	-3
-.5	-5
0	-6
.25	-6.125
.5	-6
1	-5

$x = -1.5$ and $x = 2$

6. $-x^2 + x + 6 = 0$

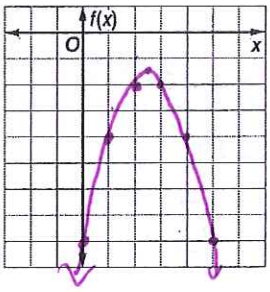
$x = \frac{-1}{2(-1)} = \frac{-1}{-2} = \frac{1}{2}$



x	y
-2	0
-1	4
0	6
.5	6.25
1	6
2	4
3	0

$x = -2$ and $x = 3$

7. $-x^2 + 5x - 8 = 0$



$x = \frac{-5}{2(-1)} = \frac{-5}{-2} = 2.5$

x	y
0	-8
1	-4
2	-2
2.5	-1.75
3	-2
4	-4

No Real Solutions

9. **GRAVITY** Use the formula $h(t) = v_0t - 16t^2$, where $h(t)$ is the height of an object in feet, v_0 is the object's initial velocity in feet per second, and t is the time in seconds.

$y = 60x - 16x^2$

x	y
0	0
1	44
2	56
3	36
4	16

a. Marta throws a baseball with an initial upward velocity of 60 feet per second. Ignoring Marta's height, how long after she releases the ball will it hit the ground?

between 3 and 4 seconds

b. A volcanic eruption blasts a boulder upward with an initial velocity of 240 feet per second. How long will it take the boulder to hit the ground if it lands at the same elevation from which it was ejected?

$y = 240x - 16x^2$

x	y
0	0
1	224
2	416
3	576
4	704
5	800
6	864
7	896
8	896
9	864
10	800
11	704
12	576

x	y
13	416
14	224
15	0

15 seconds