Chapter 9

Day 8

Solve Quadratic Equations by Graphing

factor

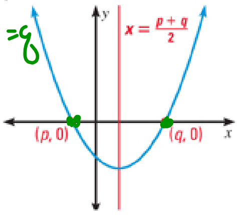
Solutions
zeros
x-intercepts
roots

KEY CONCEPT *For Your Notebook*

Graph of Intercept Form $y = a(x - p)(x - q)$ $\neq 0$

Characteristics of the graph of $y = a(x - p)(x - q)$:

- The x-intercepts are p and q. $x = p$ $x = q$
- The axis of symmetry is halfway between $(p, 0)$ and $(q, 0)$. So, the axis of symmetry is $x = \frac{p+q}{2}$.
- The parabola opens up if $a > 0$ and opens down if $a < 0$.



Ex: $\boxed{(x+2)(x+8)=0}$ up

$x = -2$ $x = -8$

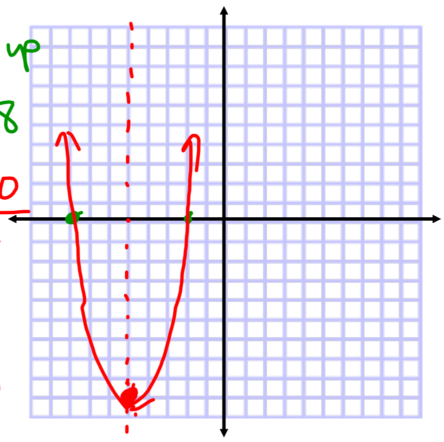
$\frac{-2+-8}{2} = \frac{-10}{2}$

$\boxed{(-5, -9)}$

$(-5+2)(-5+8)$

$-3(3)$

-9



$x = -5$

Ex: Graph $y = -(x+1)(x-5)$

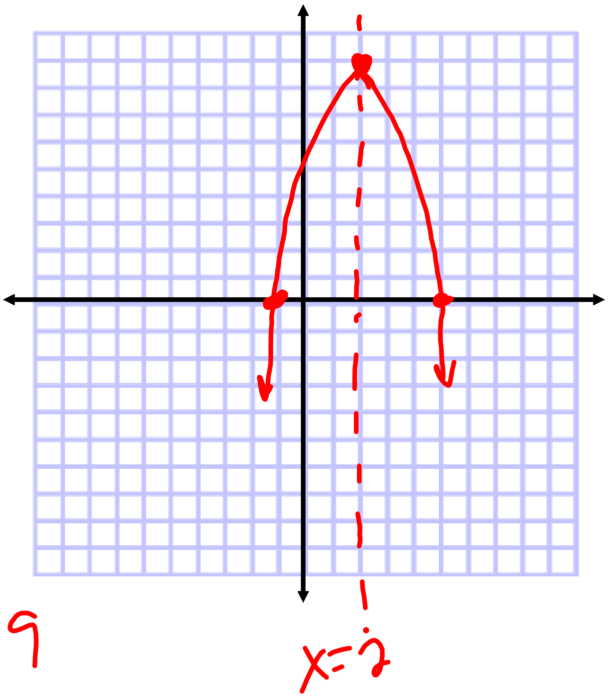
$x = -1 \quad x = 5$

$\frac{-1+5}{2} = \frac{4}{2} = 2$

$(2, 9)$

$y = -(2+1)(2-5)$

$y = -(3)(-3) = 9$



A **quadratic equation** is an equation that can be written in the **standard form** $ax^2 + bx + c = 0$ where $a \neq 0$.

Solve $x^2 - 2x = 3$ by graphing.

$-3 \quad -3$

$\boxed{x^2 - 2x - 3} = 0$ $\quad \frac{-3}{-3 \cdot 1}$

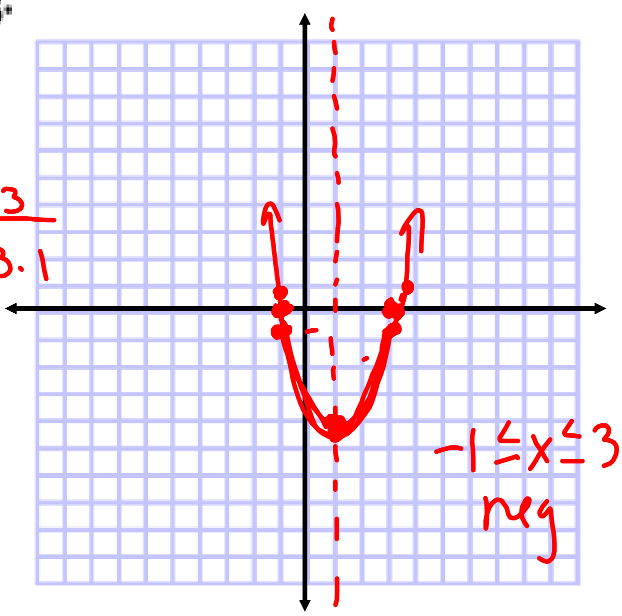
$\boxed{(x-3)(x+1)} = 0$

$x = 3, -1$

$V = (1, -4)$

$(1-3)(1+1)$

$-2(2)$



$x = 1$

Solve $-x^2 + 2x = 1$ by graphing.

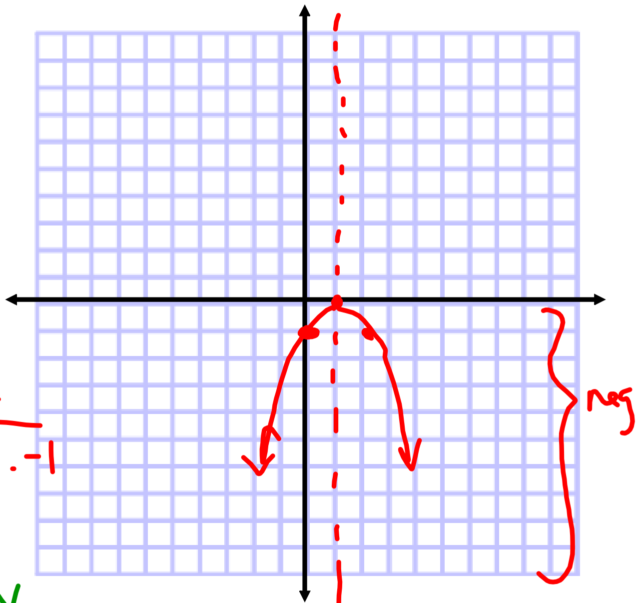
-1

$\boxed{-x^2 + 2x - 1} = 0$

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

$-(x-1)(x-1) = 0$ $\quad \frac{1}{-1 \cdot -1}$

down $\quad x = 1$



X	Y
2	
0	

$x = 1$

$(1, 0)$

Solve $x^2 + 7 = 4x$ by graphing.

$-4x \quad -4x$

$\boxed{x^2 - 4x + 7} = 0$

$(x \quad)(x \quad) = 0$

does not factor

$\frac{7}{1.7}$

-1.7

$x = \frac{-b}{2a} = \frac{4}{2} = 2$

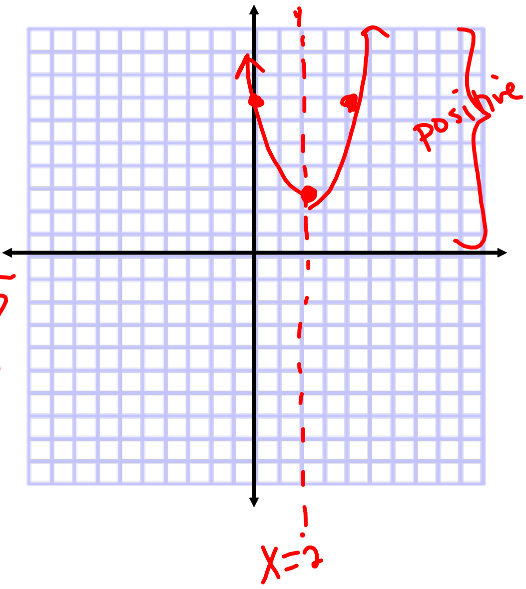
$(2, 3)$

$2^2 - 4(2) + 7$

$4 - 8 + 7$

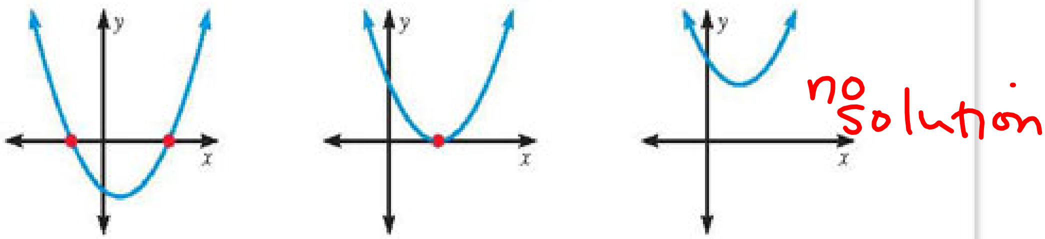
$-4 + 7$

3



KEY CONCEPT *For Your Notebook*

Number of Solutions of a Quadratic Equation



A quadratic equation has **two solutions** if the graph of its related function has **two x-intercepts.**

A quadratic equation has **one solution** if the graph of its related function has **one x-intercept.**

A quadratic equation has **no real solution** if the graph of its related function has **no x-intercepts.**

Find the zeros of $f(x) = x^2 + 6x - 7$.

$x^2 + 6x - 7 = 0$

$(x+7)(x-1) = 0$

$\boxed{x = -7, 1}$

-7

$-7 \cdot 1$

$7 \cdot -1$

Approximate the zeros of $f(x) = x^2 + 4x + 1$ to the nearest tenth.

x int

-3.8 & -3.7

INTERPRET FUNCTION VALUES
The function value that is closest to 0 indicates the x-value that best approximates a zero of the function.

x	−3.9	−3.8	**−3.7**	−3.6	−3.5	−3.4	−3.3	−3.2	−3.1
$f(x)$	0.61	0.24	**−0.11**	−0.44	−0.75	−1.04	−1.31	−1.56	−1.79

x	−0.9	−0.8	−0.7	−0.6	−0.5	−0.4	**−0.3**	−0.2	−0.1
$f(x)$	−1.79	−1.56	−1.31	−1.04	−0.75	−0.44	**−0.11**	0.24	0.61

x int

$-.3$ & $-.2$

SPORTS An athlete throws a shot put with an initial vertical velocity of 40 feet per second as shown.

a. Write an equation that models the height h (in feet) of the shot put as a function of the time t (in seconds) after it is thrown.

b. Use the equation to find the time that the shot put is in the air.

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$h = -16t^2 + 40t + 6.5$

Solution

a. Use the initial vertical velocity and the release height to write a vertical motion model.

$\boxed{h = -16t^2 + vt + s}$ **Vertical motion model**

$h = -16t^2 + vt + s$

velocity
initial
starting

initial
height