CHAPTER 12: QUADRATIC EQUATIONS

Graphing Quadratics Part #1 - Critical Points

OBJECTIVES

- I can find the number of real solutions of a quadratic
- I can graph a quadratic function by finding critical points

PART 1: # OF REAL SOLUTIONS

Definition — **Standard Form of a Quadratic Function**

A **quadratic function** is a function that can be written in the form $y = ax^2 + bx + c$, where $a \neq 0$. This form is called the **standard form of a quadratic function.** **Examples** $y = 5x^2 \quad y = x^2 + 7 \quad y = x^2 - x - 3$

Definition — **Standard Form of a Quadratic Equation**

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

The solutions of a quadratic equation and the related x-intercepts are often called **roots of the equation** or **zeros of the function.**

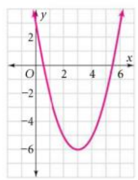
Quadratic equations can have two, one, or no solutions. You can determine how many solutions a quadratic equation has, before you solve it, by using the discriminant. The **discriminant** is the expression under the radical in the quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ ← **the discriminant**

PART 1: # OF REAL SOLUTIONS

Two real solutions

$y = x^2 - 6x + 3$



$x^2 - 6x + 3 = 0$

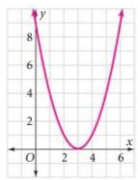
$b^2 - 4ac$: $(-6)^2 - 4(1)(3)$

$= 36 - 12$

$= 24$

One real solution

$y = x^2 - 6x + 9$



$x^2 - 6x + 9 = 0$

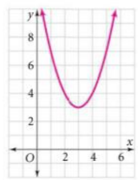
$(-6)^2 - 4(1)(9)$

$= 36 - 36$

$= 0$

No real solutions

$y = x^2 - 6x + 12$



$x^2 - 6x + 12 = 0$

$(-6)^2 - 4(1)(12)$

$= 36 - 48$

$= -12$

PART 1: # OF REAL SOLUTIONS

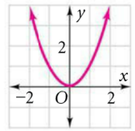
1 Find the number of solutions for each equation.

a. $x^2 = 2x - 3$ **b.** $3x^2 - 4x = 7$

PART 2: VOCABULARY

The simplest quadratic function, $f(x) = x^2$, or $y = x^2$, is the **quadratic parent function.**

The graph of a quadratic function is a U-shaped curve called a **parabola.** The graph of $y = x^2$, shown at the right, is a parabola.



You can fold a parabola so that the two sides match exactly. This property is called *symmetry*. The fold or line that divides the parabola into two matching halves is called the **axis of symmetry.**

PART 2: VOCABULARY

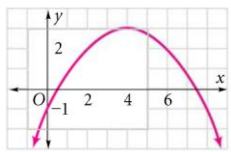
The highest or lowest point of a parabola is its **vertex,** which is on the axis of symmetry.

If $a > 0$ in $y = ax^2 + bx + c$	If $a < 0$ in $y = ax^2 + bx + c$
↓	↓
the parabola opens upward.	the parabola opens downward.
↓	↓
The vertex is the **minimum** point or lowest point of the parabola.	The vertex is the **maximum** point or highest point of the parabola.

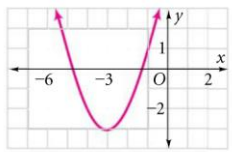
PART 2: VOCABULARY

1 Identify the vertex of each graph. Tell whether it is a minimum or maximum.

a.



b.

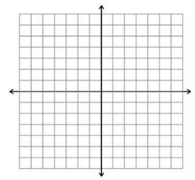


PART 3: CRITICAL POINTS/DATA

- There are several critical points or data we can find to help graph a quadratic function
  1. Y-intercept: ___________________________
  2. X-intercept(s): ____________________________
  3. Axis of symmetry: ___________________________
  4. Vertex: ___________________________

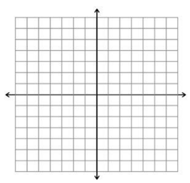
PART 3: CRITICAL POINTS

- Find the critical points of the function $f(x) = x^2 + 4x + 3$ and sketch a graph.



PART 3: CRITICAL POINTS

- Find the critical points of the function $f(x) = x^2 + 6x + 9$ and sketch a graph.



CAN YOU?? PROVE IT!!

- ❑ I can find the number of real solutions of a quadratic
- ❑ I can graph a quadratic function by finding critical points

How many solutions does the equation $y = 2x^2 + 2x - 24$ have? Find the critical points and make a quick sketch.