Algebra 1 Unit 8 - Notes

Day 1: Solving Quadratics by GCF

Review: Factor the following: $2x^2 - x - 6$

*quadratic trinomial → must use x-box

$a = 2$
$b = -1$
$c = -6$

-12
3 -4
-1

-12
1 -12 → -11
-1 12 → 11
2 -6 → -4
-2 6 → 4
3 -4 → -1
-3 4 → 1

$2x^2 - x - 6$
$2x^2 + 3x - 4x - 6$

	$2x$	3
x	$2x^2$	$3x$
-2	$-4x$	-6

$\boxed{(2x+3)(x-2)}$

Review: Factoring GCF

1) $x^2 + 9x$
x x   3 3 x
GCF: x
$\dfrac{x^2}{x} + \dfrac{9x}{x}$
$\boxed{x(x+9)}$

2) $4x^2 - 6x$
2 2 x x   2 3 x
GCF: 2x
$\dfrac{4x^2}{2x} \; \dfrac{-6x}{2x}$
$\boxed{2x(2x-3)}$

3) $-3x^2 - 12x$
3 1 x x   2 6 2 3 x
GCF: -3x
$\dfrac{-3x^2}{-3x} \; \dfrac{-12x}{-3x}$ → $\boxed{-3x(x+4)}$

Zero Product Property: A polynomial function is in *factored form* if it is written as the product of two or more linear binomial factors. The **zero product property** is used to solve an equation when one side of the equation is zero and the other is the product of factors. *must be set equal to Ø *set each x = Ø

*a·b = Ø
a, b, or both = Ø

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

$x - 2 = 0$
$+2 \;\; +2$
$x = 2$

$x + 4 = 0$
$-4 \;\; -4$
$x = -4$

$\boxed{x = 2 \text{ \& } -4}$

2) $x(x+4) = 0$

$x = 0$
no work needed here

$x + 4 = 0$
$-4 \;\; -4$
$x = -4$

$\boxed{x = 0 \text{ \& } -4}$

3) $(x+3)^2 = 0$

$x + 3 = 0$
$-3 \;\; -3$
$x = -3$

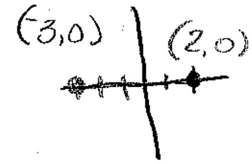
$x + 3 = 0$
$-3 \;\; -3$
$x = -3$

*only need to write once.

$\boxed{x = -3}$

Solving Quadratic Equations: In this unit, you will be solving quadratic equations. In order to understand what we mean by "solving" quadratic equations, you must understand exactly what we want to get from each equation.

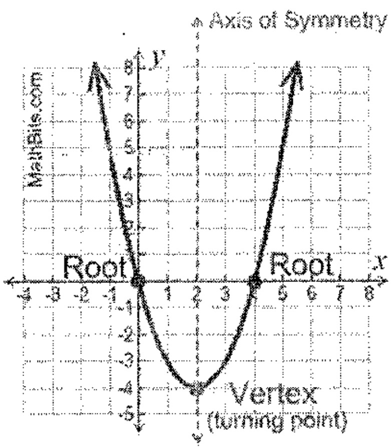
Solving a quadratic equation really means...
- where the quadratic equation crosses the x-axis
- the y-value is always Ø.



The place(s) where the graph crosses the x-axis has several names. They can be referred to as:

- x-intercepts
- roots
- Solutions
- zeroes.

What do solutions look like graphically?



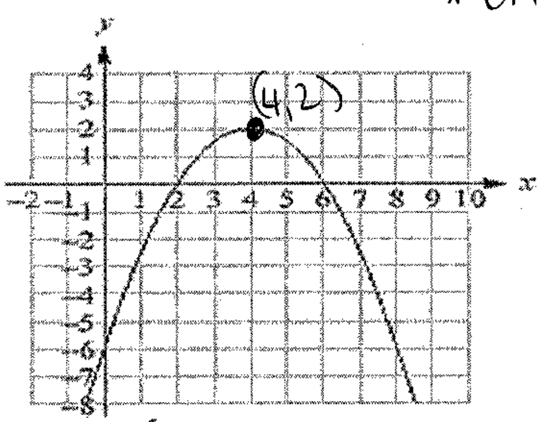
Quadratic functions have a "U" shape that can open up or open down.

For Unit 8, the most important characteristics of quadratic functions that we will discuss are the vertex and zeros.

Remember: Zeroes, Roots, Solutions, and X-Intercepts are the same thing!

We will talk more about the other characteristics of quadratic functions in Unit 9.

* only have zero, one, or two roots *

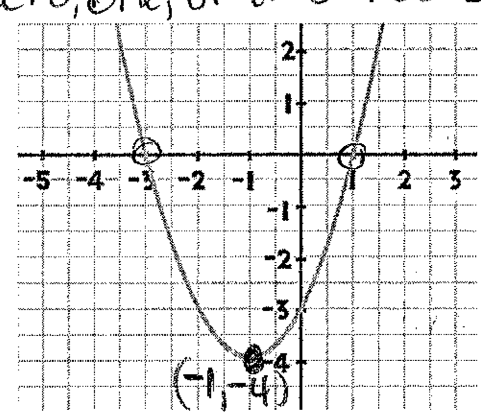


Vertex: (4,2)

Roots/Zeroes/Solutions:

x=2 x=6

Factors: (x-2)(x-6)



Vertex: (-1,-4)

Roots/Zeroes/Solutions:

x=-3 x=1

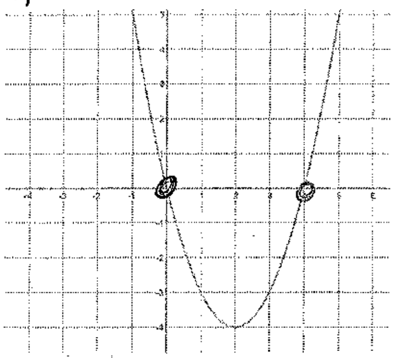
Factors: (x+3)(x-1)

* always change sign going in & out of ( ). The ( ) must equal Ø to be a solution.

Identifying Solutions

For each graph below, identify the solution(s) to the quadratic graphed.

1)

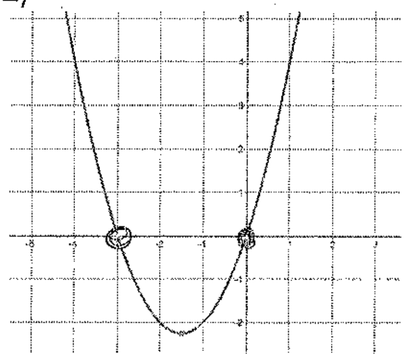


$x=0 \quad x=4$

$\downarrow \quad \downarrow$

$x \quad (x-4)$

2)

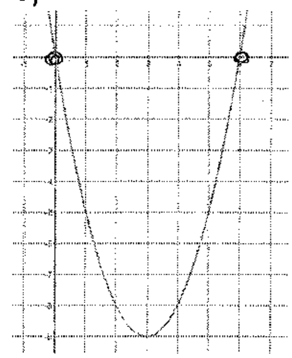


$x=-3 \quad x=0$

$\downarrow \quad \downarrow$

$(x+3) \quad x$

3)



$x=0 \quad x=6$

$\downarrow \quad \downarrow$

$x \quad (x-6)$

Using what we know about factors, we are going to write an equation in factored form that represents each graph.

1) $x(x-4)=y$

2) $(x+3)x=y$
$x(x+3)=y$

3) $x(x-6)=y$

Now, take each equation and convert them back to ~~standard~~ general form. What are the new equations?

ax^2+bx+c

1) $x(x-4)=y \rightarrow \boxed{x^2-4x=y}$

2) $x(x+3)=y \rightarrow \boxed{x^2+3x=y}$

3) $x(x-6)=y \rightarrow \boxed{x^2-6x=y}$

① make sure = Ø ② Factor (GCF or X/box)
③ Take each factor, set = Ø, solve

What would be zeros in each equation below?

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

$x=0$; $x+7=0$
$-7\ -7$

$\boxed{x=0 \quad x=-7}$

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

$x=0$; $2x-1=0$
$+1\ +1$
$2x=1$
$\frac{2x}{2}=\frac{1}{2}$

$\boxed{x=0 \quad x=\frac{1}{2}}$

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

x(x) 2 3 (x)

$x(x-6)=0$

$x=0$, $x-6=0$
$+6\ +6$

$\boxed{x=0 \quad x=6}$

4) $2x^2-8x=0$

GCF: 2x

$2x(x-4)=0$

$\frac{2x}{2}=\frac{0}{2}$; $x-4=0$
$+4\ +4$

$\boxed{x=0 \quad x=4}$

5) $x^2+x=0$

GCF: x

$x(x+1)=0$

$x=0$; $x+1=0$
$-1\ -1$

$\boxed{x=0 \quad x=-1}$

6) $-3x^2-12x=0$

GCF = -3x

$-3x(x+4)=0$

$\frac{-3x}{-3}=\frac{0}{-3}$; $x+4=0$
$-4\ -4$

$\boxed{x=0 \quad x=-4}$

*make = Ø 1st

7) $4x^2-4x=2x$
$-2x\ -2x$

$4x^2-6x=0$

GCF = 2x

$2x(2x-3)=0$

$\frac{2x}{2}=\frac{0}{2}$; $2x-3=0$
$+3\ +3$

$x=0$ $\quad \frac{2x}{2}=\frac{3}{2}$

$\boxed{x=0 \quad x=3/2}$

8) $5x^2=50x$
$-50x\ -50x$

$5x^2-50x=0$

GCF: 5x

$5x(x-10)=0$

$\frac{5x}{5}=\frac{0}{5}$; $x-10=0$
$+10\ +10$

$\boxed{x=0 \quad x=10}$

9) $-3x^2=12x$
$-12x\ -12x$

$-3x^2-12x=0$

GCF: -3x

$-3x(x+4)=0$

$\frac{-3x}{-3}=\frac{0}{-3}$; $x+4=0$
$-4\ -4$
$x=0$ $\quad x=-4$

$\boxed{x=0 \quad x=-4}$