What's Going On?

Checking In	Weekend Assignment
Minds on	How Many Solutions?
Action!	Solving Quadratics
Consolidation	TIPS

Learning Goal - I will be able to solve quadratics and use the discriminant to determine the number of roots.

Checking In

F.F.M.

little books

Please do this before you RAFT

Determine the inverse.

$$f(x) = -2(x-3)^2 + 5$$

$y = -2(x-3)^2 + 5$

SWITCH x & y

$x = -2(y-3)^2 + 5$

solve for y

$-5 \quad -5$

$\frac{x-5}{-2} = \frac{-2(y-3)^2}{-2}$

$\frac{-(x-5)}{2} = (y-3)^2$

$$\pm\sqrt{-\frac{1}{2}(x-5)} = \sqrt{(x-3)^2}$$

$$y-3 = \pm\sqrt{-\frac{1}{2}(x-5)}$$
$$+3 \quad +3$$

$$y = \pm\sqrt{-\frac{1}{2}(x-5)} + 3$$

$$f^{-1}(x) = \pm\sqrt{-\frac{1}{2}(x-5)} + 3$$

Checking In

Weekend Assignment

Due now

Unit Test

Next Tuesday

Minds on

How many zeros?

$$f(x) = -2x^2 + 12x - 18$$

$$g(x) = 2x^2 + 6x - 8$$

$$h(x) = x^2 - 4x + 7$$

Minds on

How many zeros?

$$f(x) = -2x^2 + 12x - 18$$

1. convert to vertex form $y = a(x-h)^2 + k$ look at a and k
2. Factor it
3. Find the zeros/roots using the quadratic formula
4. Use the discriminant

Minds on

How many zeros?

$$g(x) = 2x^2 + 6x - 8$$

Minds on

How many zeros?

$$h(x) = x^2 - 4x + 7$$

Minds on

How many zeros?

We can have:

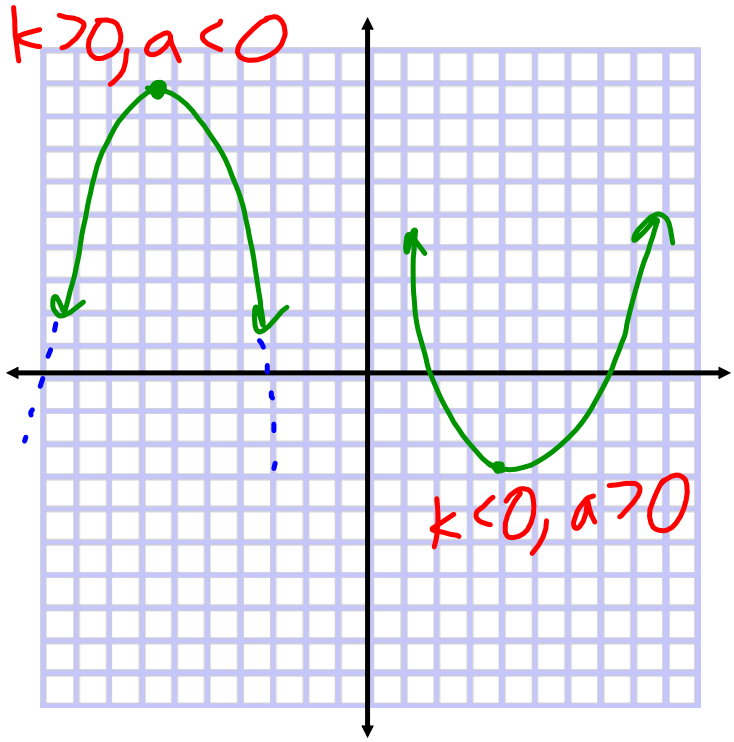
two distinct roots

no real roots

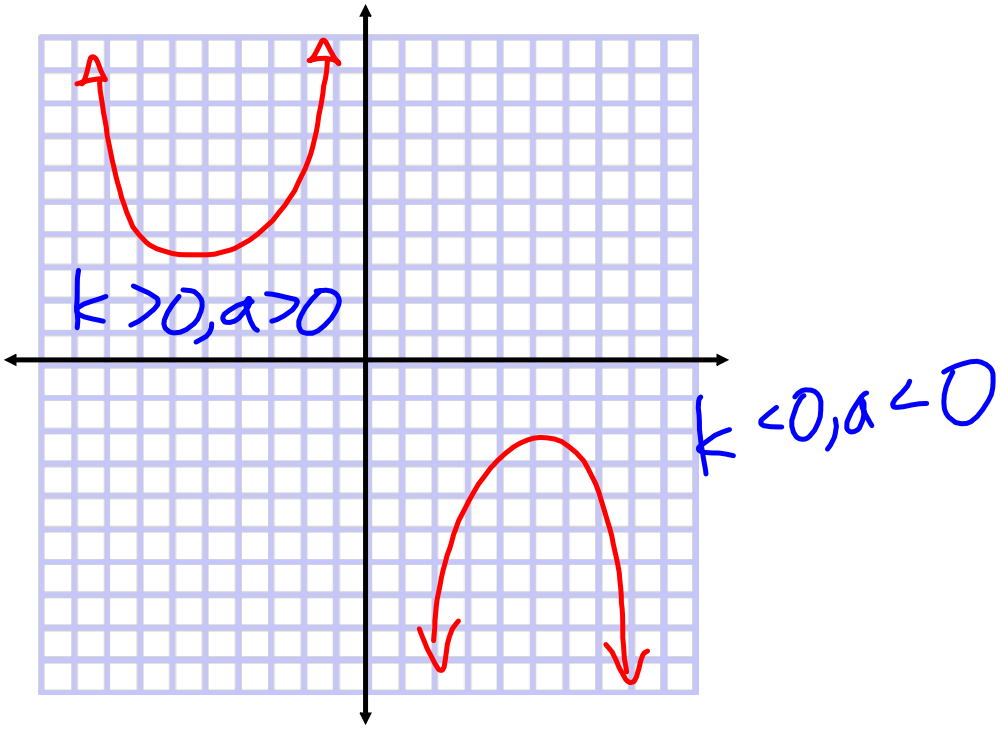
two equal roots (vertex is on x-axis)

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

Two Distinct Roots

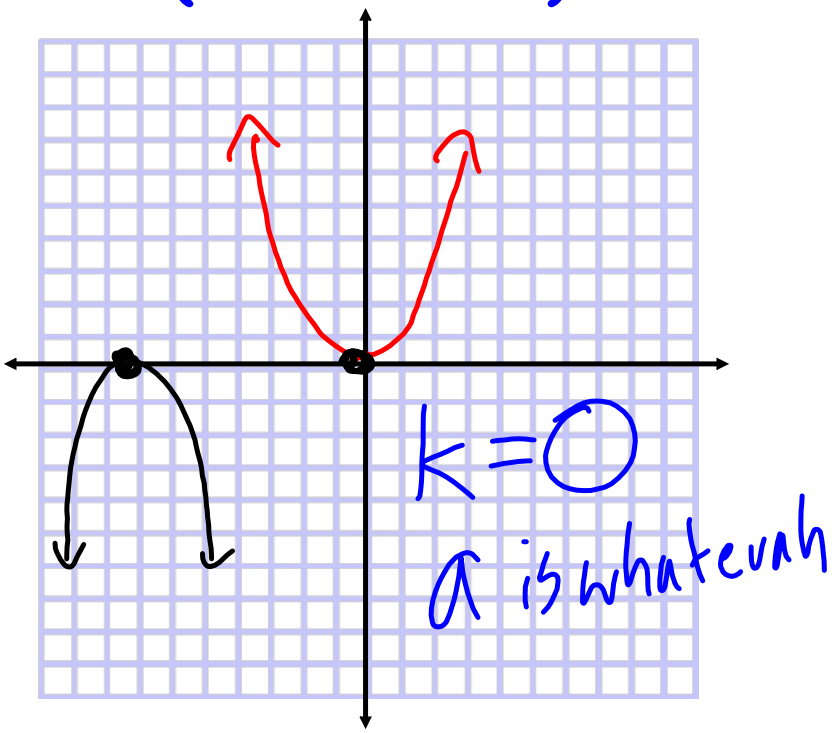


No "Real" Roots



Two Equal Roots

(Double Root)



How many zeros?

How can we discriminate between quadratics with two distinct roots, two equal roots and no equal roots using The Quadratic Formula?

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

two distinct roots	two equal roots	no real roots
$b^2-4ac > 0$	$b^2-4ac = 0$	$b^2-4ac < 0$

Minds on

How many zeros?

How can we discriminate between quadratics with two distinct roots, two equal roots and no equal roots using **The Quadratic Formula?**

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

n

discriminate → $b^2 - 4ac$

Minds on

How many zeros?

How can we discriminate between quadratics with two distinct roots, two equal roots and no equal roots using **The Quadratic Formula?**

We use the **discriminant**

$$b^2 - 4ac$$

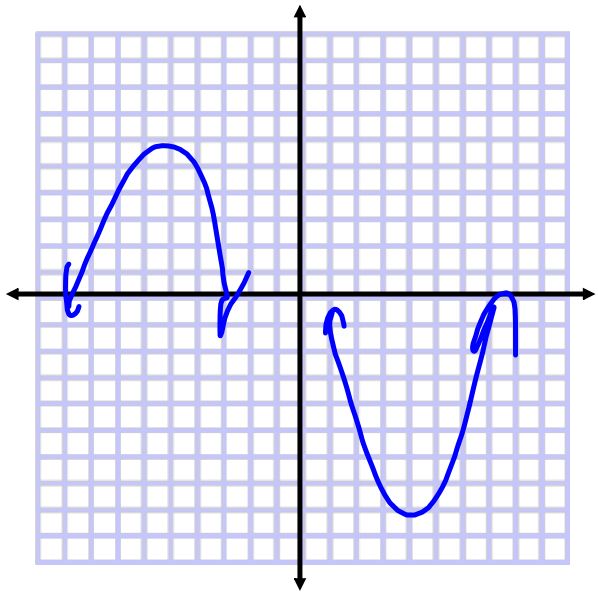
The Discriminant

$$b^2 - 4ac$$

two distinct roots

The discriminant is > 0

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



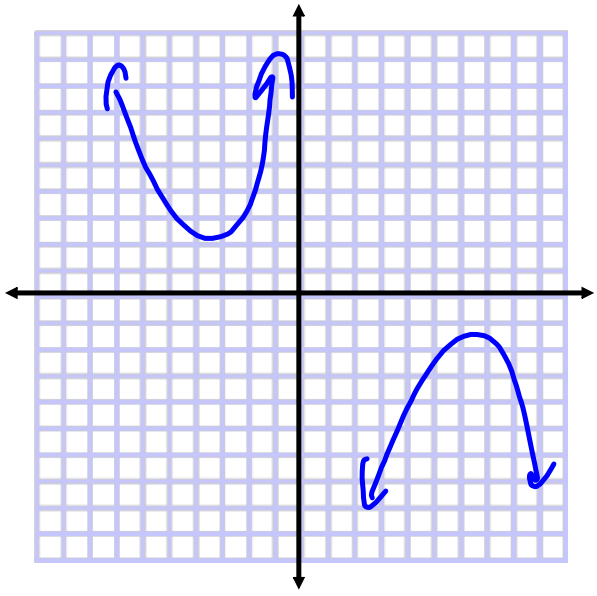
The Discriminant

$$b^2 - 4ac$$

no real roots

The discriminant is < 0

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



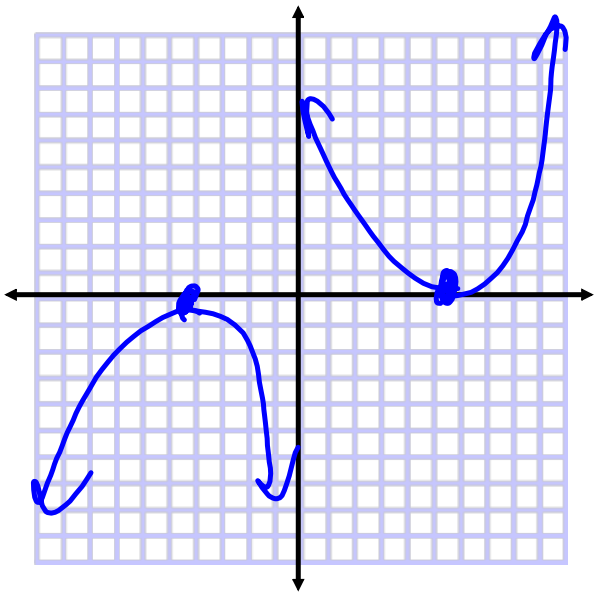
The Discriminant

$$b^2 - 4ac$$

two equal roots

The discriminant is 0

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



Minds on

How many zeros?

of x-intercepts

$b^2 - 4ac$

1 $f(x) = -2x^2 + 12x - 18$ two equal roots

$(12)^2 - 4(-2)(-18) = 0$

2 $g(x) = 2x^2 + 6x - 8$ two real roots, distinct

$(6)^2 - 4(2)(-8) = 100$

0 $h(x) = x^2 - 4x + 7$ no real roots

$(-4)^2 - 4(1)(7) = -12$

Minds on

Our Good friend *k*

Determine the value of *k* so that the quadratic function below has only one zero.

$$f(x) = \overset{a}{x^2} - \overset{b}{k}x + \overset{c}{3}$$

$b^2 - 4ac = 0$

$(-k)^2 - 4(1)(3) = 0$

$k^2 - 12 = 0$

$k^2 = \pm\sqrt{12}$

$k = \pm\sqrt{12}$

$k = \pm 2\sqrt{3}$

$(\sqrt{2+2+3})$

Minds on

How many zeros?

Using *a* and *k*

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

If **a<0, k>0** or if **a>0, k<0** we have two zeros.

If **a<0, k<0** or if **a>0, k>0** we have no zeros.

If **k=0** we have one zero.

Minds on

How many zeros?

$$f(x) = a(x-r)(x-s)$$

2

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

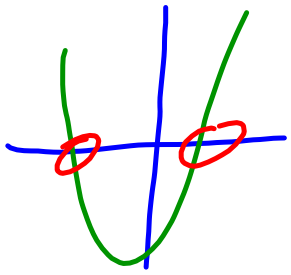
1

Action!

Solving Quadratics

→ finding the roots/zeros/x-intercepts

We can solve quadratics by:



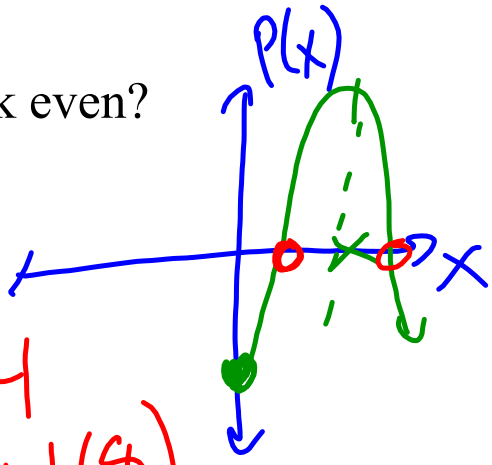
1. Graphing
2. Factoring
3. Using the quadratic formula

Action!

Solving Quadratics

Anthony owns a business that sells parts for electronic game systems. The profit function for his business can be modelled by the equation $P(x) = -0.5x^2 + 8x - 24$, where x is the quantity sold, in thousands, and $P(x)$ is the profit in thousands of dollars.

How many parts must he sell to break even?



$P(x) = -0.5x^2 + 8x - 24$

$= -0.5(x^2 - 16x + 48)$

$= -0.5(x-4)(x-12)$ -4 -12

He breaks even after selling 4,000 units.

Action!

Solving Quadratics

A water balloon is catapulted into the air from the top of a building. The height, $h(t)$, in metres, of the balloon after t seconds is $h(t) = -5t^2 + 30t + 10$.

What are the domain and range of this function?

Domain = $\{t \in R \mid 0 \le t \le 6.32\}$

Range = $\{h(t) \in R \mid 0 \le h(t) \le 55\}$

$h(t) = -5t^2 + 30t + 10$

$= -5(t^2 - 6t - 2)$

* cannot be factored use quadratic formula

$a = -5, b = 30, c = 10$

$t = 6.32$ & -0.32

determine t-value of vertex $\frac{6.32 - 0.32}{2} = 3$

sub $t = 3$ into original equation, solve for $h(t)$

$= 55$

You also could have tried completing the square on the original equation!!!

When will the balloon reach a height of 30 m?

$h(t) = -5t^2 + 30t + 10$

$30 = -5t^2 + 30t + 10$

$-30 \qquad -30$

$-5t^2 + 30t - 20 = 0$

Quadratic formula

$t = 0.764$ & 5.236

Consolidation

TIPS

Pg. 178 #14

Pg. 186 #14

Consolidation

Homework

Pg. 177

1, 2, 6 - 11, 13, *14*

Pg. 185

1 - 3, 5 - 10, *14*