What's Going On?

Checking In	Weekend Assignment
Minds on	How Many Zeros?
Action!	The Discriminant, *a* and *k*
Consolidation	TIPS

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

Checking In

L.G.L.

Please do this before you RAFT

Find the zeros of the function $f(x) = (3x - 1) + \frac{1}{x + 1}$.

We need a common denominator!

$$f(x) = \frac{(x+1)(3x-1)}{(x+1)} + \frac{1}{(x+1)}$$

$$f(x) = \frac{(x+1)(3x-1)+1}{(x+1)}$$

$$f(x) = \frac{(x+1)(3x-1)+1}{(x+1)}$$

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

$$f(x) = \frac{3x^2 + 2x}{(x+1)}$$

Zeros.... set $f(x) = 0$ and solve

$$\frac{3x^2 + 2x}{(x+1)} = 0$$

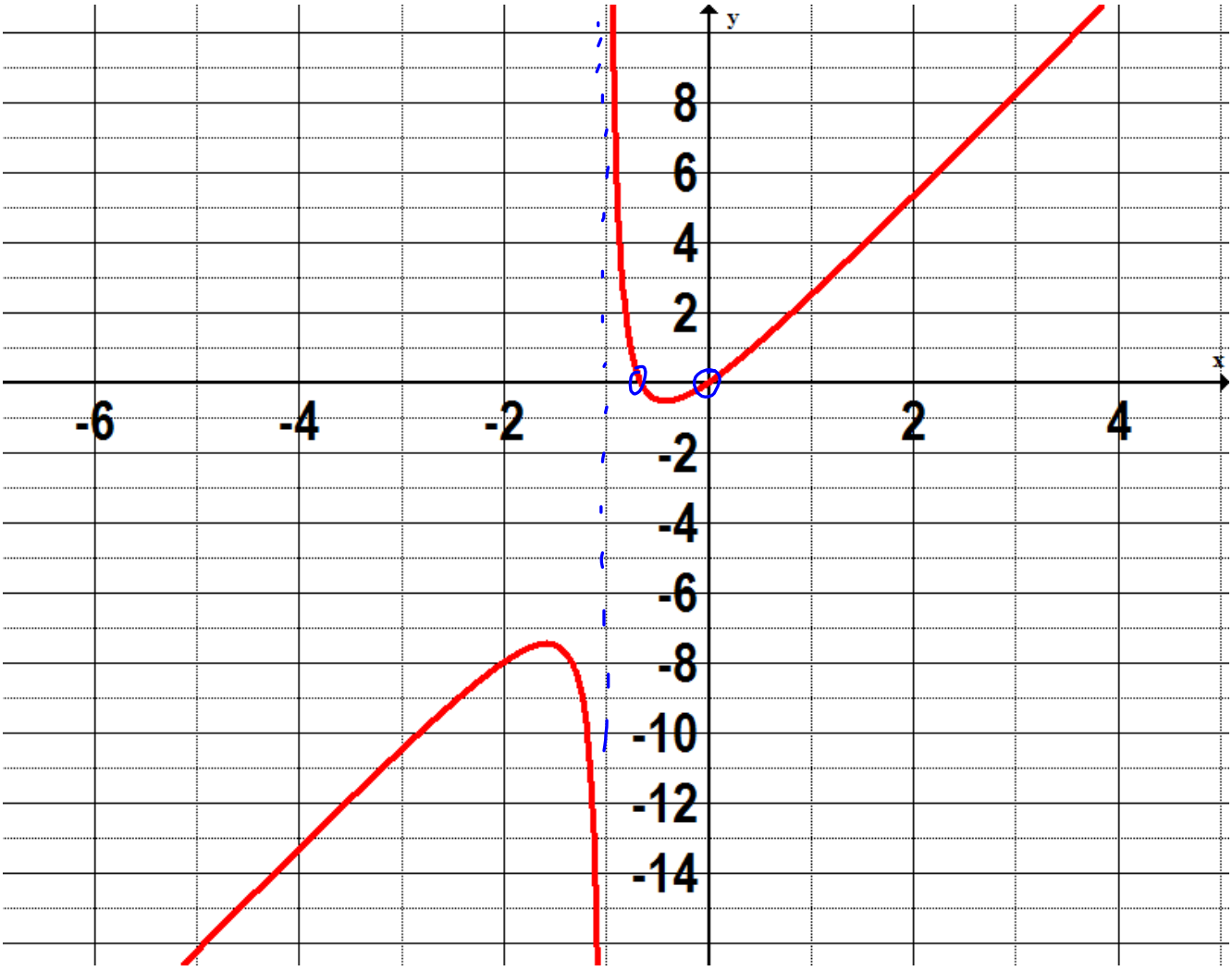
Zeros.... set $f(x)=0$ and solve

$$\frac{(x+1)(3x^2+2x)}{(x+1)} = 0(x+1)$$

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

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

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


y
x
8
6
4
2
-2
-4
-6
-8
-10
-12
-14
-6
-4
-2
2
4

Checking In

Weekend Assignment

Due today*

Unit Test

Next Next Thursday

Minds on

How many zeros?

For each quadratic equation, determine the number of zeros / x-intercepts.

$f_1(x) = 2x^2 + 6x - 8$	2
$f_2(x) = -2x^2 + 12x - 18$	1
$f_3(x) = x^2 - 4x + 7$	0
$g_1(x) = -(x-4)^2 + 1$	2
$g_2(x) = -4(x+3)^2$	1
$g_3(x) = -3(x-1)^2 - 6$	0

Minds on

How many zeros?

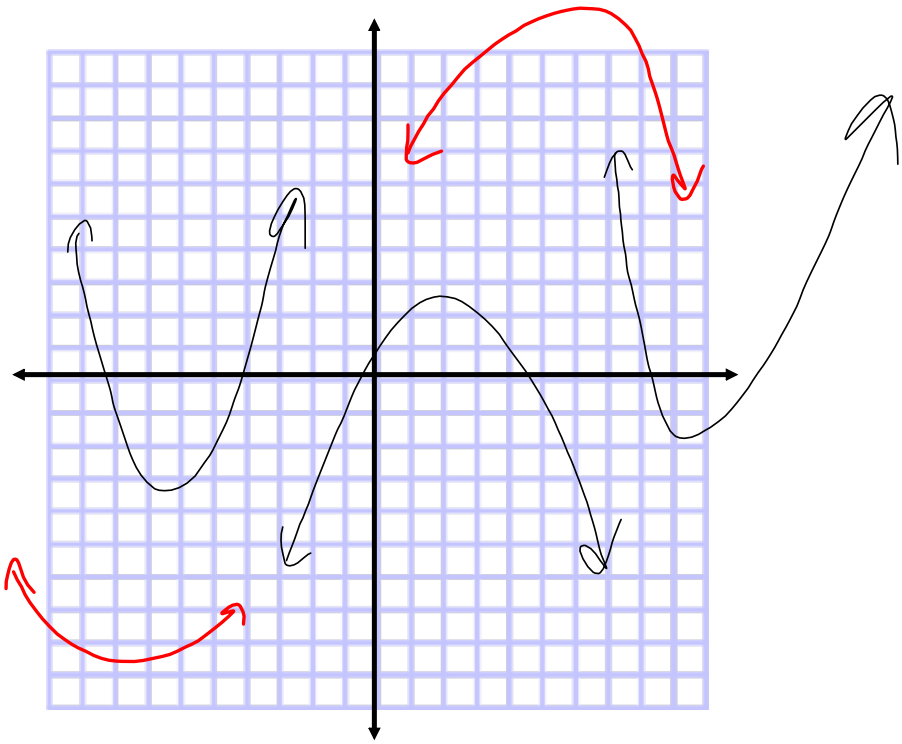
We can have:

two distinct roots

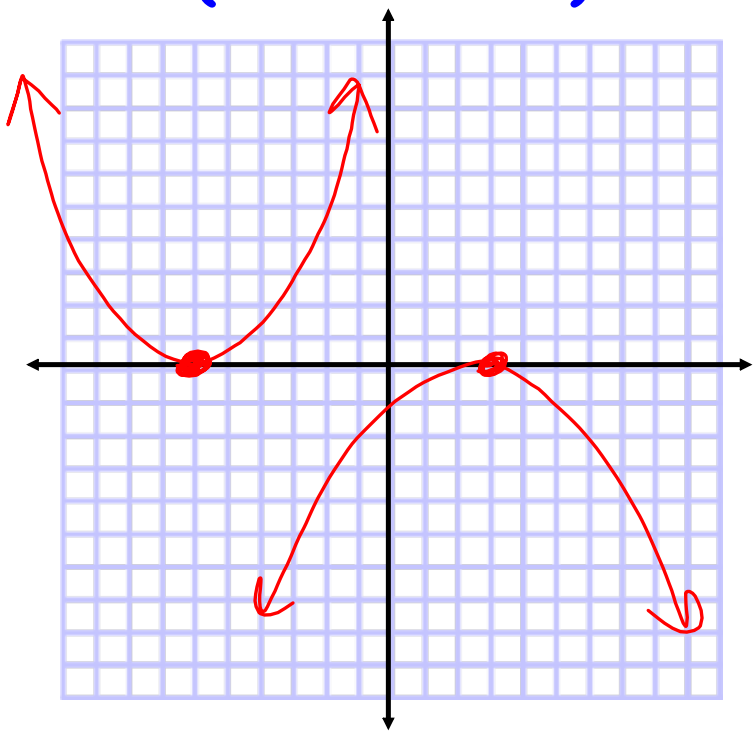
two equal roots

no real roots

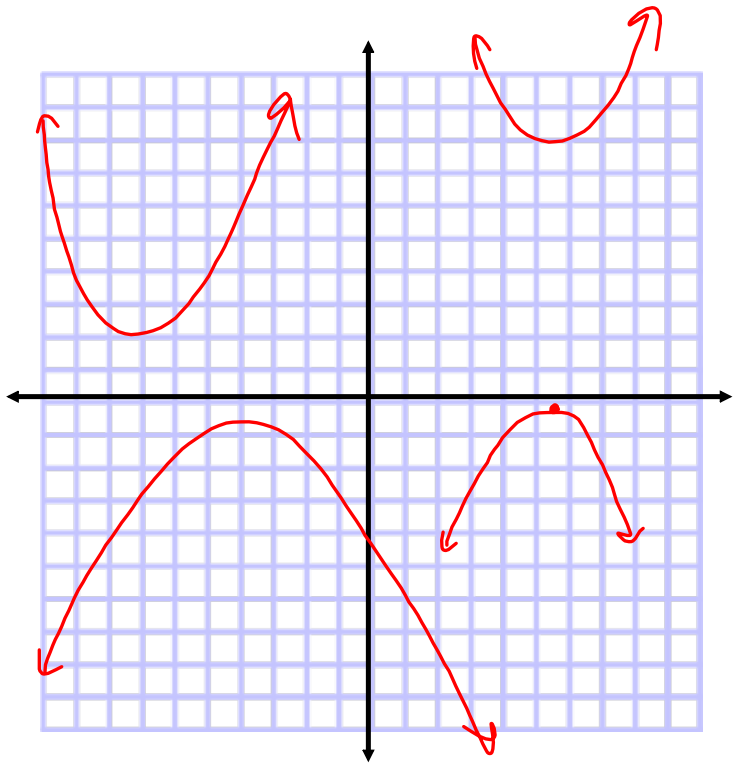
Two Distinct Roots



Two Equal Roots
(Double Root)



No "Real" Roots



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
$b^2 - 4ac > 0$	$b^2 - 4ac = 0$	$b^2 - 4ac < 0$

Action!

How many zeros?

How can we discriminate between quadratics with two distinct roots, two equal roots and no equal roots using

The Quadratic Formula?

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

We use the discriminate

Action!

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**

$$b^2 - 4ac$$

Action!

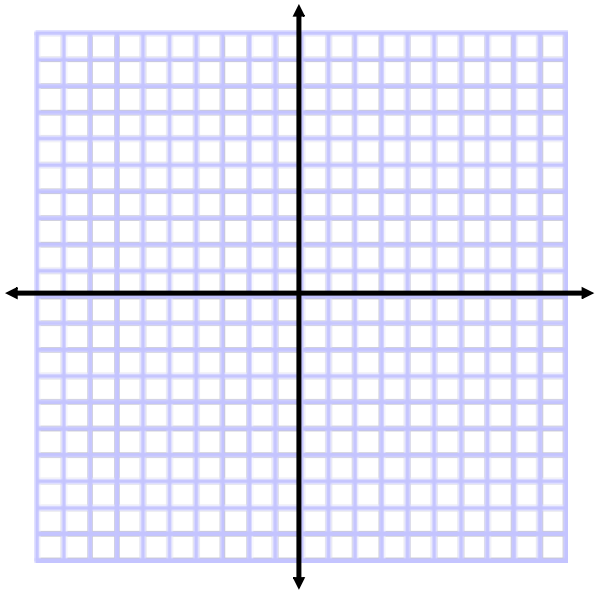
The Discriminant

$$b^2 - 4ac$$

two distinct roots

The discriminant is > 0

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



Action!

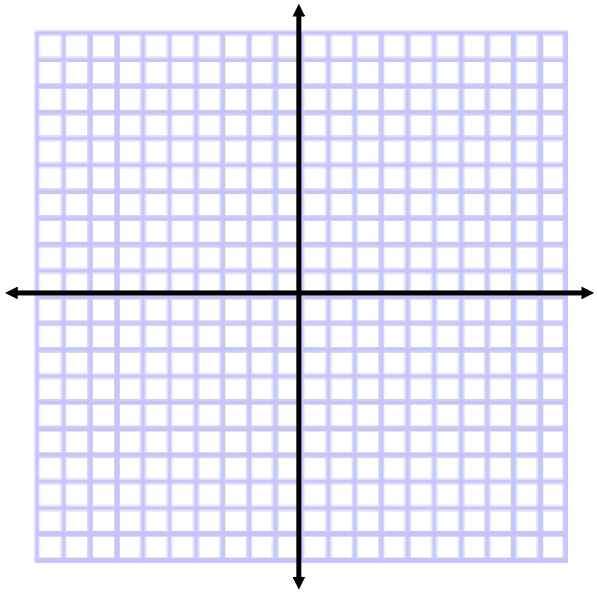
The Discriminant

$$b^2 - 4ac$$

two equal roots

The discriminant is $=$ 0

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



Action!

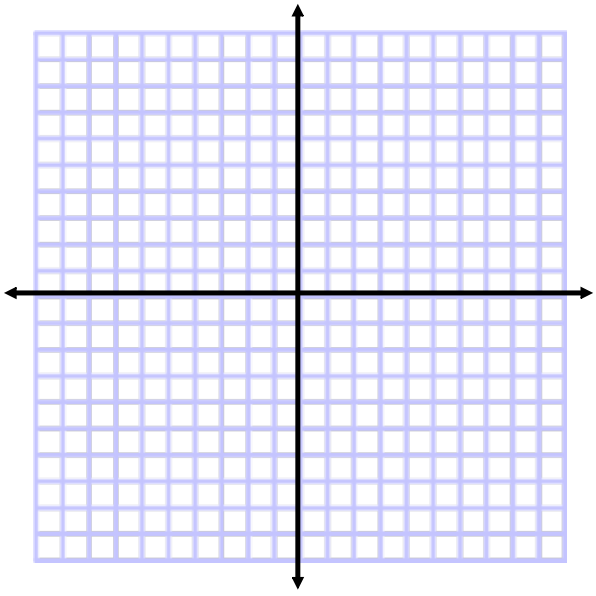
The Discriminant

$$b^2 - 4ac$$

no real roots

The discriminant is < 0

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



Action!

How many zeros?

Given Vertex Form

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

How can we determine the number of zeros a quadratic has given its vertex form equation?

Two distinct roots if $a>0$ and $k<0$
$a<0$ and $k>0$

∴

Two equal roots if $k=0$

No real roots if $a>0$ and $k>0$
$a<0$ and $k<0$

Minds on

How many zeros?

For each quadratic equation, determine the number of zeros / x-intercepts.

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Consolidation

How many zeros?

For each quadratic equation, determine the number of zeros / x-intercepts.

$f_1(x) = 2x^2 + 6x - 8$

$b^2 - 4ac = 6^2 - 4(2)(-8)$

$= 36 + 64$

$= 100$ * two distinct roots.

$f_2(x) = -2x^2 + 12x - 18$

$b^2 - 4ac = 12^2 - 4(-2)(-18)$

$= 144 - 144$ * "double" root

$= 0$

$f_3(x) = x^2 - 4x + 7$

$b^2 - 4ac = (-4)^2 - 4(1)(7)$

$= 16 - 28$ * no real roots

$= -12$

Consolidation

TIPS

NOT IN YOUR NOTE!

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

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

Consolidation

TIPS

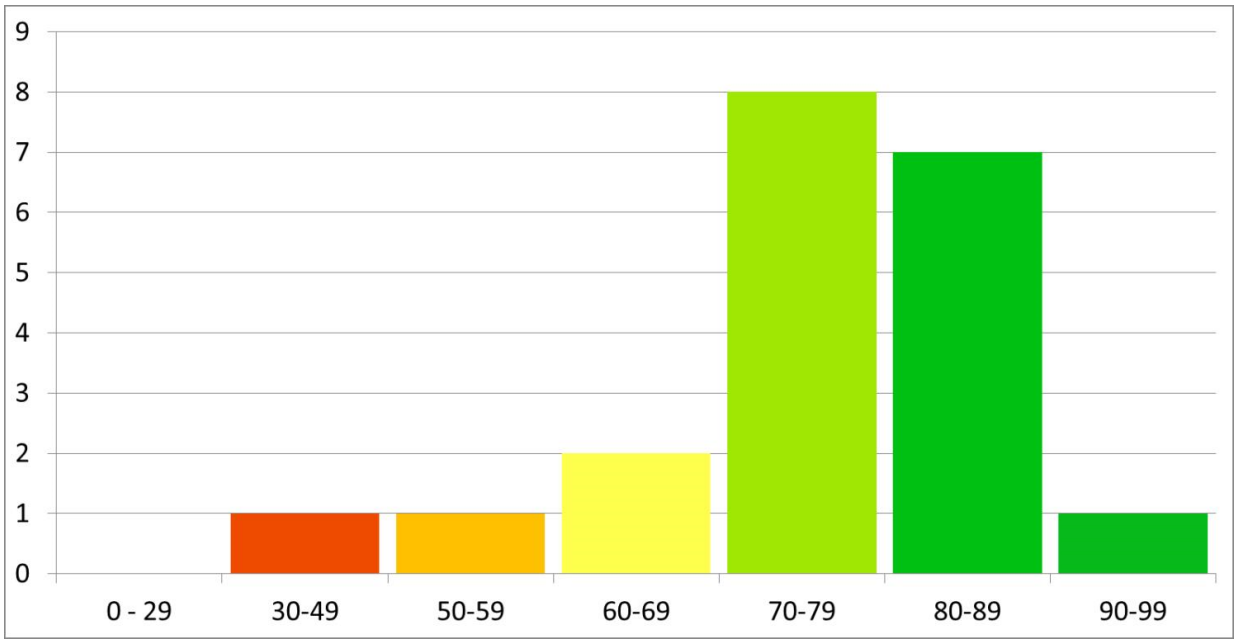
Show that $(x^2 - 1)k = (x - 1)^2$ has one solution for only one value of k.

Consolidation

TIPS

For what values of k does the function $f(x) = (k+1)x^2 + 2kx + k - 1$ have no zeros? One zero? Two zeros?

Test 1



Test 1