Warm up

Solve using the quadratic formula.

(Determine the roots of each equation)

1) $4x^2 + 4x + 1 = 0$

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

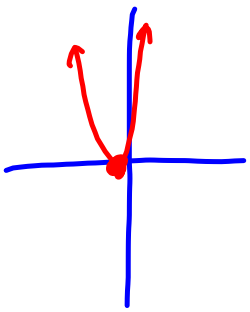
$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(4)(1)}}{2(4)}$$

$$= \frac{-4 \pm \sqrt{16 - 16}}{8}$$

$$= \frac{-4 \pm \sqrt{0}}{8}$$

$$= -\frac{4}{8}$$

$$= -\frac{1}{2}$$

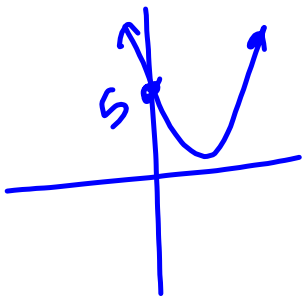


2) $3x^2 - 1x + 5 = 0$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(3)(5)}}{2(3)}$$

$$= \frac{1 \pm \sqrt{-59}}{6}$$

No sol.



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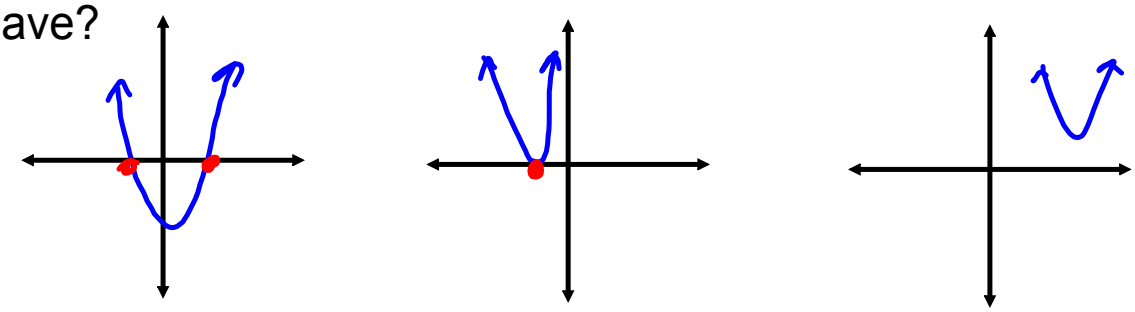
Unit 4 - Standard and Vertex Form

Day ~~7~~ 6 - Nature of the Roots

zeros
x intercepts

Nature of the Roots

How many x-intercepts (zeros) can a quadratic function have?



How many solutions can a quadratic equation have?

2 solutions 1 solution 0 solutions

The discriminant: b^2-4ac

Allows you to see the number of roots/x-intercepts/zeros without having to graph or use the whole quadratic formula.

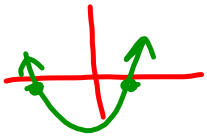
$b^2-4ac > 0 \rightarrow$ 2 solutions

$= 0 \rightarrow$ 1 solution

$< 0 \rightarrow$ 0 solution

Example: Determine the number of roots for each of the following equations.

↳ $b^2 - 4ac$



$a=1$
$b=-5$
$c=-11$

1) $x^2 - 5x - 11 = 0$

$b^2 - 4ac = (-5)^2 - 4(1)(-11)$
$= 25 + 44$
$= 69 > 0$ ∴ 2 solutions

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

$3x^2 - 4x + 6 = 0$
$b^2 - 4ac = (-4)^2 - 4(3)(6)$
$= 16 - 72$
$= -56 < 0$ ∴

3) ~~$9x^2 - 60x + 100 = 0$~~

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4) $2(x-1)^2 + 3 = 0$ No sol.

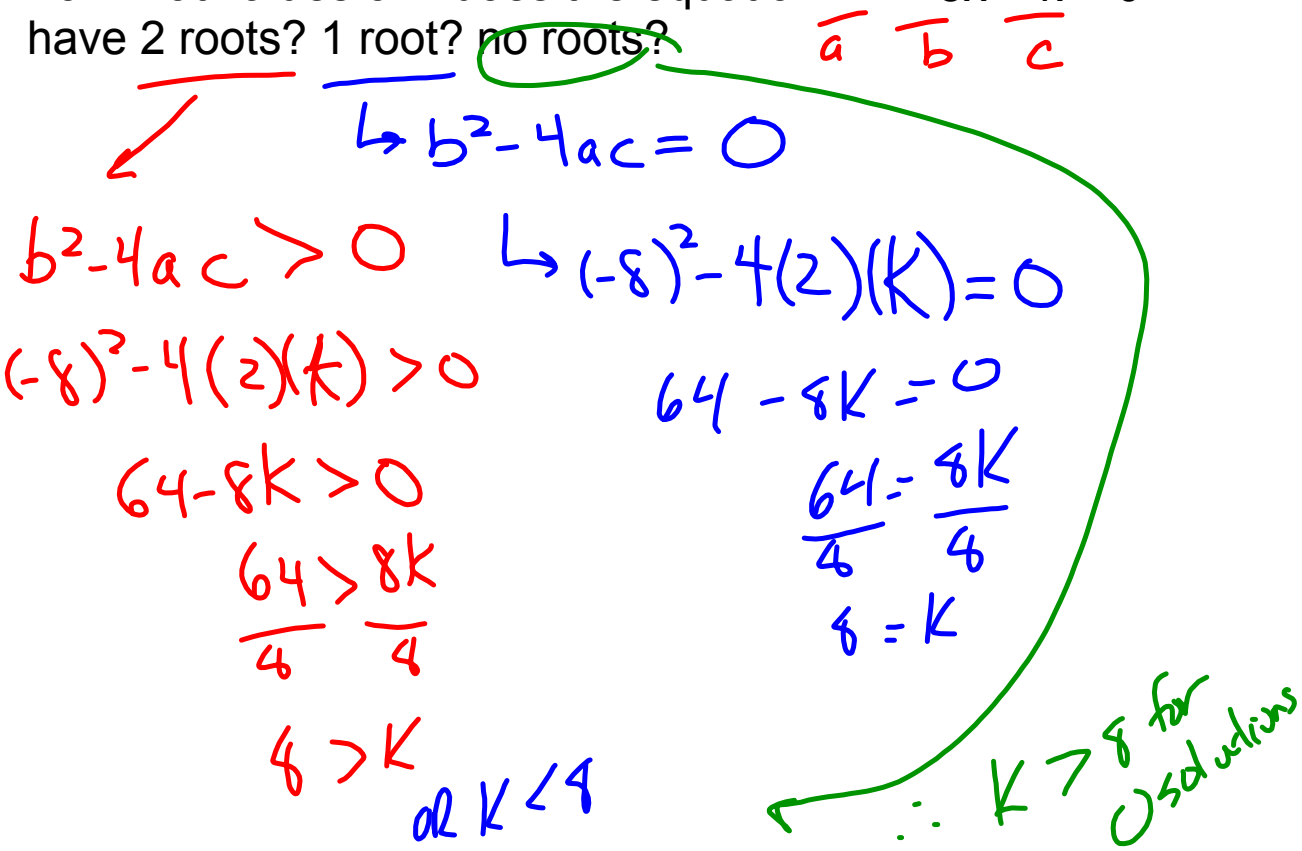
$2(x^2 - 2x + 1) + 3 = 0$ std form to use quad formula
$2x^2 - 4x + 2 + 3 = 0$
$2x^2 - 4x + 5 = 0$

Vertex Form
∴ vertex is (1, 3) and opens up

Now... $b^2 - 4ac$
$= (-4)^2 - 4(2)(5)$
$= 16 - 40$
$= -24 < 0$

∴ No solution ∴ No solution.

Example:
For what values of k does the equation $2x^2 - 8x + k = 0$ have 2 roots? 1 root? no roots?



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