Vocabulary

zeros, x-int, solutions

Nature of the Roots - In a polynomial, the type of solutions that it has: how many, real or imaginary, and rational or irrational?

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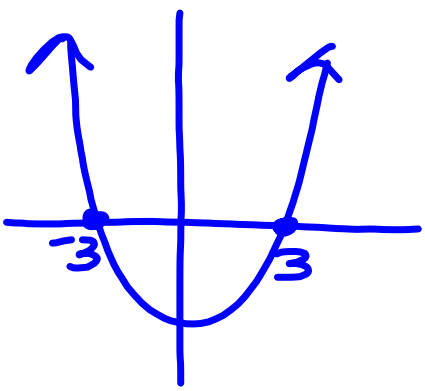
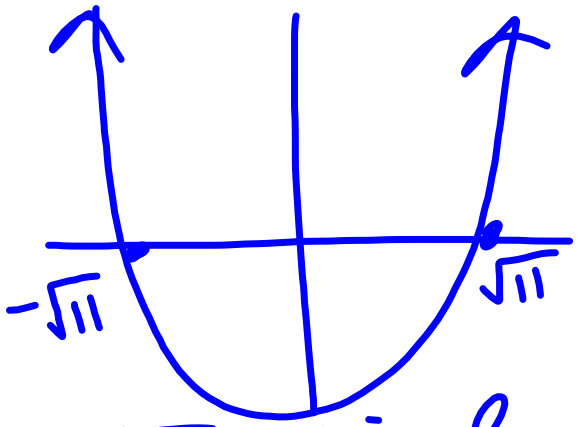
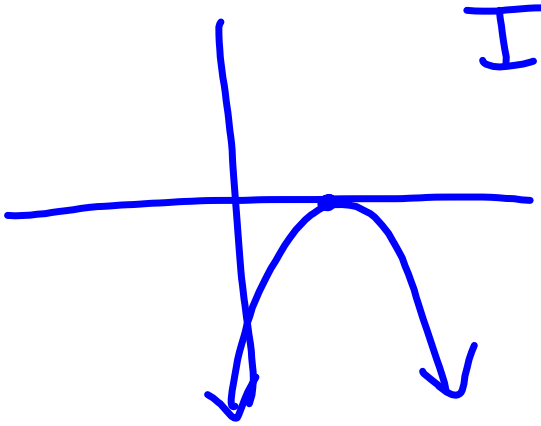
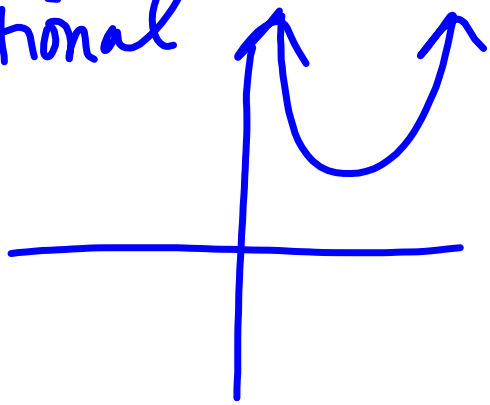
$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$





Irrational





ax^2+bx+c S.F.

Q.F. $\dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

x^2-5x+8

The Discriminant

MGSE9-12.A.REI.4 Solve quadratic equations in one variable.

MGSE9–12.A.REI.4b Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, factoring, completing the square, and the quadratic formula, as appropriate to the initial form of the equation (limit to real number solutions). Build a function that models a relationship between two quantities.

What am I learning today?

How to calculate the discriminant and use it to describe a quadratic's solutions.

How will I show that I learned it?

Calculate the discriminant and describe the nature of the roots

What is the **discriminant**? $b^2 - 4ac$

For quadratics, it describes the **nature of the roots** (types of solutions).

It answers two questions (in Algebra I)...

1) How many **real roots** do we have?

2) Are they **rational** or **irrational**?

$\sqrt{2}$ not a perfect square

To find the **discriminant**...

1) Set your equation equal to **0** and put in **standard form**.

2) Label **a, b, and c**.

3) Plug into the formula **$b^2 - 4ac$**.

4) Describe the **nature of the roots**.

The Discriminant

$$b^2 - 4ac$$

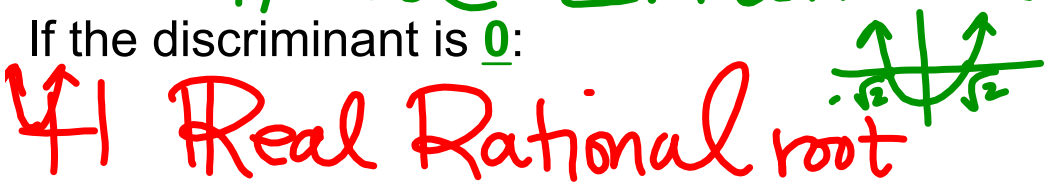
If the discriminant is **positive AND a perfect square**:

2 Real Rational Roots

If the discriminant is **positive AND not a perfect square**:

2 Real Irrational Roots

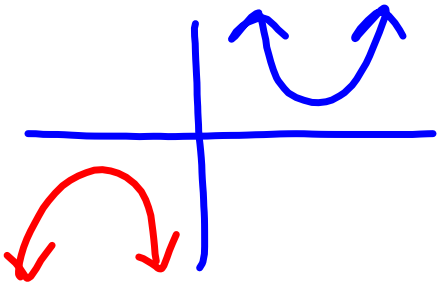
If the discriminant is **0**:



1 Real Rational root

If the discriminant is **negative**:

no Real Solutions



Find the discriminant and use it to describe the roots your quadratic equation has:

Ex. 1 $f(x) = x^2 + 6x + 11$

$a = 1$
$b = 6$
$c = 11$

$0 = x^2 + 6x + 11$

$b^2 - 4ac$

$(6)^2 - 4(1)(11) = -8$

* no Real roots/solutions

Find the discriminant and use it to describe the roots your quadratic equation has:

Ex. 2 $x^2 + 9 = 6x$

$-6x \quad -6x$

$a = 1$

$b = -6$

$c = 9$

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

$(-6)^2 - 4(1)(9) = 0$

1 Real Rational root

Find the discriminant and use it to describe the roots your quadratic equation has:

Ex. 3 $x^2 + 4x + 15 = 10 - 2x$

$+2x \quad -10 \quad -10 \quad +2x$

$x^2 + 6x + 5 = 0$

$a = 1$

$b = 6$

$c = 5$

$(6)^2 - 4(1)(5) = 16$

2 Real Rational Roots

Find the discriminant and use it to describe the roots your quadratic equation has:

Ex. 4 $2x^2 + 8 = x^2 - 6x + 2$

$-1x^2 - 2 \quad -x^2 + 6x - 2$

$a = 1$
$b = 6$
$c = 6$

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

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

2 Real Irrational roots

You Try: For the following, use the discriminant to find the nature of the roots.

Don't forget to set = 0!!!

1. $x^2 - 3x + 2 = 0$

D = 1 2 ℝ rational roots

2. $2x^2 - 4x = -3$

D = -8 no ℝ roots

3. $5x = 3x^2 + 1$

D = 13 2 ℝ - irrational roots

4. $x^2 = x + 4$

D = 17 2 ℝ irrational roots

5. $8x^2 + 8 = 2x^2 + 2x + 4$

D = -92 no ℝ roots

6. $3x^2 + 4 = 6x + 1$

D = 0 1 Real rational root