WARM UP

Solve the following quadratic equation by... (a) factoring

$6x^2 - 13x - 5 = 0$

$6x^2 - 13x = 5$

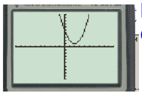
Factoring,	Completing the Square	Quadratic Formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$\left(\frac{6x-15}{3}\right)\left(\frac{6x+2}{2}\right) = 0$ $(2x-5)(3x+1) = 0$ $2x-5=0$, $3x+1=0$ $2x=5$, $3x=-1$ $x=5/2$, $x=-1/3$ $x=2.5$		$x = \frac{13 \pm \sqrt{(-13)^2 - 4(6)(-5)}}{2(6)}$ $x = \frac{13 \pm \sqrt{169+120}}{12}$ $x = \frac{13 \pm \sqrt{289}}{12}$ $x = \frac{13 \pm 17}{12}$ $x_1 = \frac{13+17}{12} = \frac{30}{12} = \frac{5}{2} = 2.5$ $x_2 = \frac{13-17}{12} = \frac{-4}{12} = -\frac{1}{3}$

Non-Real Roots

- What if it is not possible to factor a quadratic equation and you cannot use completing the square or quadratic formula because there is a negative under the radical sign????

? ? ?

EXAMPLE: $y = 1x^2 - 4x + 5$



Look, it doesn't cross the x-axis

What happens if I try to use the quadratic formula?

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

a = 1
b = -4
c = +5

$x = \frac{4 \pm \sqrt{16-20}}{2}$

$x = \frac{4 \pm \sqrt{-4}}{2}$

error!

The Nature of the Roots

- any quadratic equation can be solved using the quadratic formula...

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

Discriminant
- enables you to determine the "Nature of the Roots" without actually finding the roots.

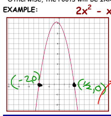
D = b^2 - 4ac

- there are THREE cases...

CASE #1: Real and Unequal Roots
- this happens when Discriminant > 0.
- the quadratic will have two real and unequal roots.

NOTE: If the discriminant is a perfect square, then the roots will be RATIONAL. (factored)
Otherwise, the roots will be IRRATIONAL.

EXAMPLE: $2x^2 - x - 6 = 0$



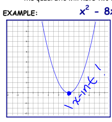
Calculate the discriminant value

D = b^2 - 4ac

$D = b^2 - 4ac$
$= (-1)^2 - 4(2)(-6)$
$= 1 + 48$
$= 49$

CASE #2: Real and Equal Roots
$(x-4)(x-4) = 0$
$x=4$, $x=4$
- this happens when Discriminant = 0.
- the quadratic will have two real and equal roots (one real root).

EXAMPLE: $x^2 - 8x + 16 = 0$



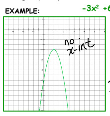
Calculate the discriminant value

D = b^2 - 4ac

$D = (-8)^2 - 4(1)(16)$
$= 64 - 64$
$D = 0$

CASE #3: Non-Real and Unequal Roots
- this happens when Discriminant < 0.
- the quadratic will have two non-real and unequal roots (imaginary/complex roots)

EXAMPLE: $-3x^2 + 6x - 5 = 0$



Calculate the discriminant value

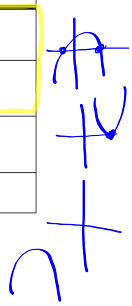
D = b^2 - 4ac

$D = (6)^2 - 4(-3)(-5)$
$= 36 - 60$
$D = -24$

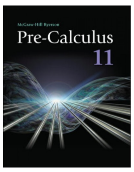
non real Roots

SUMMARY: Nature of the Roots

	Value of the Discriminant			
	D = b^2 – 4ac	Real or Non-real	Equal or Unequal	Rational or Irrational
1	1. D> 0 but not a perfect square	Real	Unequal 2 x-int	Irrational
	2. D>0 and is a perfect square	Real	Unequal 2 x-int	Rational
2	3. D = 0	Real	Equal 1 x-int	Rational
3	4. D< 0	Non-real no x-int	Unequal	n/a



Homework/Classwork



p254 #1, 2 a, c, e
#5b, e #7d

1 a) D=33 Real, unequal, irrational
c)

#5b

$6\left(h^2 + \frac{h}{6} - \frac{1}{2} = 0\right)$

$6h^2 + h - 3 = 0$