Name Key

Section 5.6

Quadratic Formula and the Discriminant

Solve the following equations:

1. $x^2 - 4 = 0$

$(x-4)(x+4)=0$

$x = 4, -4$

2. $x^2 + 2x = 15$

$x^2+2x-15=0$

$(x+5)(x-3)=0$

$x = -5, 3$

3. $x^2 - 4x + 8 = 0$ can't factor!

$x = \frac{4 \pm \sqrt{(-4)^2-4(1)(8)}}{2(1)} = \frac{4 \pm \sqrt{-16}}{2} =$

$\frac{4 \pm 4i}{2} = \boxed{2 \pm 2i}$

What if you can't factor to solve the equation?

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

Solve the following quadratic equations over the set of complex numbers.

1) $x^2 - 6x + 73 = 0$

$x = \frac{6 \pm \sqrt{(-6)^2-4(1)(73)}}{2(1)}$

$= \frac{6 \pm \sqrt{-256}}{2}$

$= \frac{6 \pm 16i}{2} = \boxed{3 \pm 8i}$ imaginary

2. $x^2 - 14x + 50 = 0$

$x = \frac{14 \pm \sqrt{(-14)^2-4(1)(50)}}{2(1)}$

$= \frac{14 \pm \sqrt{-4}}{2}$

$= \frac{14 \pm 2i}{2} = \boxed{7 \pm i}$ imaginary

3. $x^2 + 2x + 65 = 0$

$x = \frac{-2 \pm \sqrt{2^2-4(1)(65)}}{2(1)}$

$= \frac{-2 \pm \sqrt{-256}}{2}$

$= \frac{-2 \pm 16i}{2} = \boxed{-1 \pm 8i}$ imaginary

4. $4x^2 - 21x - 18 = 0$

$x = \frac{21 \pm \sqrt{(-21)^2-4(4)(-18)}}{2(4)}$

$x = \frac{21 \pm \sqrt{729}}{8}$

$= \frac{21 \pm 27}{8}$

$\frac{21+27}{8} = \boxed{6}$

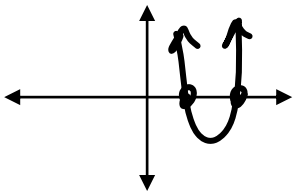
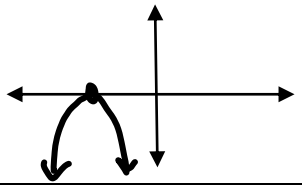
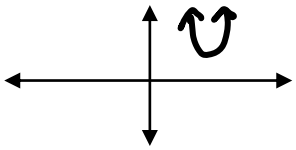
$\frac{21-27}{8} = \frac{-6}{8} = \boxed{\frac{-3}{4}}$

2 real solutions

The Discriminant

What is the discriminant and how does it help? b^2-4ac

* it tells you the # and type of solutions

Discriminant	# and Type of Roots	Sketch (x-intercepts)
b^2-4ac > 0 & is a perfect square	2 roots real, rational * factor *	
$b^2 - 4ac > 0$ & is not a perfect square	2 roots real, irrational	
$b^2 - 4ac = 0$	1 root (VERTEX) real, rational	
$b^2 - 4ac < 0$	2 imaginary roots	

Find the value of the discriminant, describe how many and what type of roots and solve for x using the Quadratic Formula.

1. $x^2 + 8x + 15 = 0$

$8^2-4(1)(15)$
$64-60$
$d=4$ * perfect square

2 roots, real, rational

2. $x^2 + 4x - 3 = 0$

$4^2-4(1)(-3)$
$16+12$
$d=28$

2 roots, real, irrational

3. $4x^2 - 12x + 9 = 0$

$(-12)^2-4(4)(9)$
$144-144$
$d=0$

1 root real, rational (VERTEX)

4. $x^2 - 2x + 8 = 0$

$(-2)^2-4(1)(8)$
$4-32$
$d=-28$

2 roots, imaginary