Algebra 2 The Quadratic Formula Notes Date:

A quadratic equation: $\boldsymbol{ax^2 + bx + c = 0}$

Can be solved using the quadratic formula:

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

Example: Solve the equation: $3x^2 + 23x + 40 = 0$

$a = 3$	$b^2 - 4ac$	$x = \frac{-23 \pm \sqrt{49}}{2(3)}$
$b = 23$	$23^2 - 4(3)(40)$	$x = \frac{-23 \pm 7}{6}$
$c = 40$	49	$x = \frac{-23+7}{6}$ $\quad$ $x = \frac{-23-7}{6}$
		$x = \frac{-16}{6}$ $\quad$ $x = \frac{-30}{6}$
		$x = \frac{-8}{3}$ $\quad$ $x = -5$

Example: Solve the equation: $3x^2 + 2x = 2$

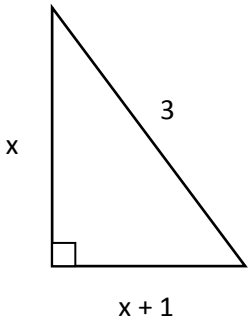
$3x^2 + 2x - 2 = 0$

$a = 3$	$b^2 - 4ac$	$x = \frac{-2 \pm \sqrt{28}}{2(3)}$
$b = 2$	$(2)^2 - 4(3)(-2)$	$x = \frac{-2 \pm \sqrt{4*7}}{6}$
$c = -2$	$4 - (-24) = 28$	$x = \frac{-2 \pm 2\sqrt{7}}{6}$
		$x = \frac{-2}{6} \pm \frac{2\sqrt{7}}{6}$
		$x = \frac{-1}{3} \pm \frac{\sqrt{7}}{3}$

Example: Solve the equation: $5x^2 + 14x - 3 = 0$

Example: Solve the equation: $x^2 - 3x = 9$

SAT Question: The longer leg of a right triangle is 1 cm longer than the shorter leg. The hypotenuse is 3 cm long. What is the length of the shortest side?



$x = shorter\ leg$

$x + 1 = longer\ leg$

$c^2 = a^2 + b^2$

$3^2 = x^2 + (x+1)^2$

$9 = x^2 + x^2 + 2x + 1$

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

$a = 2$

$b = 2$

$c = -8$

$b^2 - 4ac$

$2^2 - 4(2)(-8)$

$4 + 64 = 68$

$x = \frac{-2 \pm \sqrt{68}}{2(2)}$

$x \approx \frac{-2 \pm 8.25}{4}$

$x \approx \frac{-2+8.25}{4}$ $x \approx \frac{-2-8.25}{4}$

$x \approx 1.56$ $x \approx -2.56$

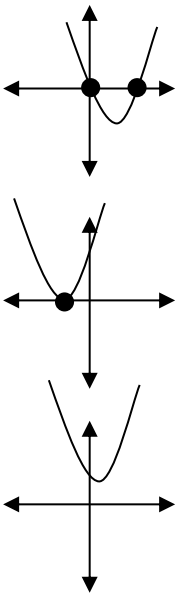
length of side must be positive
so $x \approx 1.56$

The Discriminant $b^2 - 4ac$

when $b^2 - 4ac > 0$ 2 real solutions

when $b^2 - 4ac = 0$ 1 real solution

when $b^2 - 4ac < 0$ 0 real solutions
(2 imaginary solutions)



Using the Discriminant Notes

Determine the type and number of solutions in each quadratic equation

Example: $x^2 + 6x + 8 = 0$

$\underline{b^2 - 4ac}$

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

$36 - 32 = 4$ 2 real solutions

Example: $x^2 + 6x + 9 = 0$

$\underline{b^2 - 4ac}$

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

$36 - 36 = 0$ 1 real solution

Example: $x^2 + 6x + 10 = 0$

$\underline{b^2 - 4ac}$

$6^2 - 4(1)(10)$

$36 - 40 = -4$ 0 real solutions (2 imaginary solutions)

Example: $2x^2 + 7x - 18 = 0$

$\underline{b^2 - 4ac}$

Example: $x^2 - x + 6 = 0$

$\underline{b^2 - 4ac}$

Example: $4x^2 - 12x = -9$

$\underline{b^2 - 4ac}$