Solving by Quadratic Formula

Non Factorable Methods		
Completing the Square	**Finding Square Roots**	**Quadratic Formula**
$ax^2 + bx + c = 0$, when $a = 1$ and b is an even #	$ax^2 - c = 0$ Parenthesis in equation	$ax^2 + bx + c = 0$ Any equation in standard form Large coefficients
Examples $x^2 - 6x + 11 = 0$ $x^2 - 2x - 20 = 0$	**Examples** $2x^2 + 5 = 9$ $5(x + 3)^2 - 5 = 20$ $x^2 - 36 = 0$	**Examples** $3x^2 + 9x - 1 = 0$ $20x^2 + 36x - 17 = 0$

The Quadratic Formula

for equations in standard form: $y = ax^2 + bx + c$

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

x represents the zeros and solutions.

$b^2 - 4ac$ is the discriminant

Practice with the Quadratic Formula

For the quadratic equations below, use the quadratic formula to find the solutions. Write your answer in simplest radical form.

1) $4x^2 - 13x + 3 = 0$ a = 4 b = -13 c = 3

$$x = \frac{-(-13) \pm \sqrt{(-13)^2 - 4(4)(3)}}{2(4)}$$

$$x = \frac{13 \pm \sqrt{169 - 48}}{8}$$

$$x = \frac{13 \pm \sqrt{121}}{8}$$

$$x = \frac{13 \pm 11}{8} \qquad x = \frac{13 + 11}{8} \qquad x = \frac{13 - 11}{8}$$

$$x = \frac{24}{8} \qquad x = \frac{2}{8} \text{ OR } \frac{1}{4}$$

Discriminant: 121

x = 3, 1/4

2) $9x^2 + 6x + 1 = 0$ a = 9 b = 6 c = 1

$$x = \frac{-(6) \pm \sqrt{(6)^2 - 4(9)(1)}}{2(9)}$$

$$x = \frac{-6 \pm \sqrt{36 - 36}}{18}$$

$$x = \frac{-6 \pm \sqrt{0}}{18}$$

$$x = \frac{-6 \pm 0}{18} \qquad x = \frac{-6 + 0}{18} \qquad x = \frac{-6 - 0}{18}$$

$$x = \frac{-6}{18} \qquad x = \frac{-6}{18}$$

Discriminant: 0

$x = -\frac{1}{3}$

$x = \frac{-1}{3}$

3) $7x^2+8x+3=0$ a = 7 b = 8 c = 3

$$x=\frac{-(8)\pm\sqrt{(8)^2-4(7)(3)}}{2(7)}$$

$$x=\frac{-8\pm\sqrt{64-84}}{14}$$

$$x=\frac{-8\pm\sqrt{-20}}{14}$$ * negative under √, do not simplify

$$x=\frac{-8+\sqrt{-20}}{14} \quad x=\frac{-8-\sqrt{-20}}{14}$$

Discriminant: −20 - imaginary!

$x = \frac{-4+\sqrt{-20}}{7}, \frac{-4-\sqrt{-20}}{7}$

4) $-3x^2+2x=8$ a = −3 b = 2 c = 8

+8 +8

$-3x^2+2x+8=0$

$$x=\frac{-(2)\pm\sqrt{(2)^2-4(-3)(8)}}{2(-3)}$$

$$x=\frac{-2\pm\sqrt{4+96}}{-6}$$

$$x=\frac{-2\pm\sqrt{100}}{-6}$$

$$x=\frac{-2\pm10}{-6} \quad x=\frac{-2+10}{-6} \quad x=\frac{-2-10}{-6}$$

Discriminant: 100

$x = -\frac{4}{3}, 2$ $\quad x=\frac{8}{-6}$ $\quad x=\frac{-12}{-6}$

5) $6x^2+3=10x$ a = 6 b = −10 c = 3

−10x −10x

$6x^2-10x+3=0$

$$x=\frac{-(-10)\pm\sqrt{(-10)^2-4(6)(3)}}{2(6)}$$

$$x=\frac{+10\pm\sqrt{100-72}}{12}$$

$$x=\frac{10\pm\sqrt{28}}{12}$$ *

$\sqrt{28}$ → $\sqrt{4}\sqrt{7}$ → $2\sqrt{7}$

$$x=\frac{10\pm2\sqrt{7}}{12}$$

$$x=\frac{10+2\sqrt{7}}{12} \quad x=\frac{10-2\sqrt{7}}{12}$$

Discriminant: 28

$x = \frac{5+1\sqrt{7}}{6}, \frac{5-1\sqrt{7}}{6}$

6) $\frac{1}{2}x^2+6x+13=0$ a = 1/2 b = 6 c = 13

$$x=\frac{-(6)\pm\sqrt{(6)^2-4(\frac{1}{2})(13)}}{2(\frac{1}{2})}$$

$$x=\frac{-6\pm\sqrt{36-26}}{1}$$

$$x=-6\pm\sqrt{10}$$ * - cannot simplify any further

$$x=-6+\sqrt{10} \quad x=-6-\sqrt{10}$$

Discriminant: 10

$x = -6+\sqrt{10}, -6-\sqrt{10}$