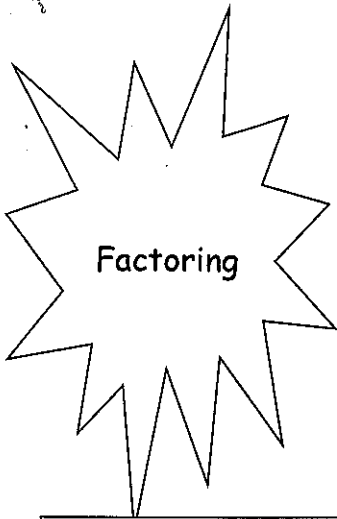


How do I solve quadratic equations?

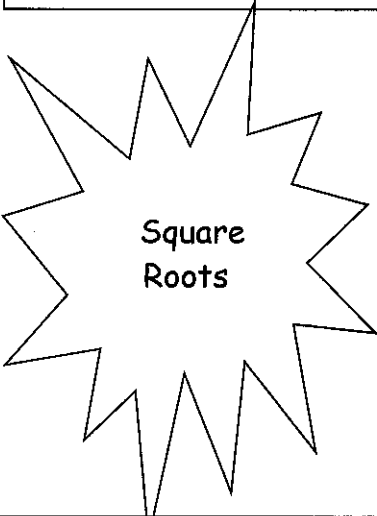


Procedure:

$$x^2 + 5x + 4 = 0$$

$$4x^2 = 4x - 1$$

$$3x^3 - 27x = 0$$

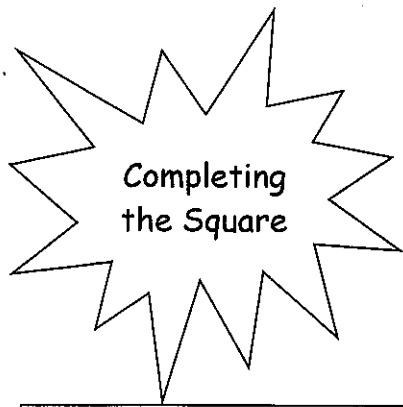


Procedure:

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

$$8 - 2x^2 = -6$$

$$(2x - 3)^2 = 12$$



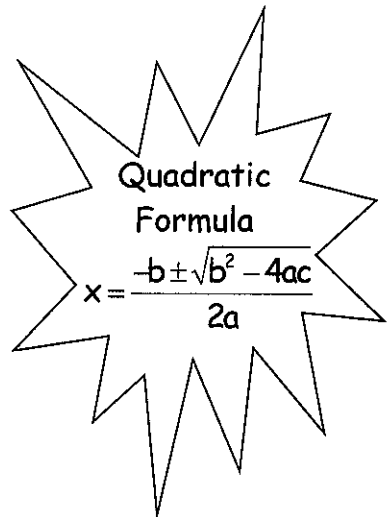
Completing
the Square

Procedure:

$$x^2 - 4x + 6 = 0$$

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

$$x^2 - 8x + 21 = 6$$



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

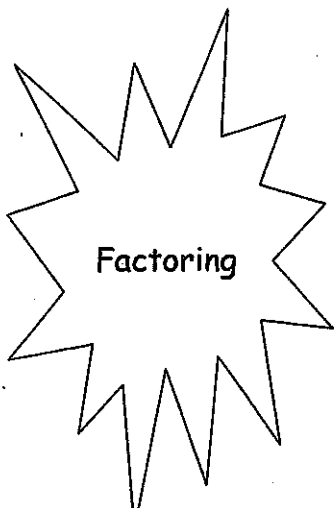
Procedure:

$$6x^2 + 4x - 2 = 0$$

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

$$16 = 3x - 4x^2$$

How do I solve quadratic equations?



Factoring

Procedure:

- ① Move all terms to one side so that squared term is positive.
- ② Factor (GCF, Trinomial, Difference of squares, grouping)
- ③ Solve each factor using Zero Product Property
 - a) Set factors equal to zero
 - b) solve for x

$x^2 + 5x + 4 = 0$

Factors: $\begin{array}{r} 4 \\ \times \\ 5 \end{array}$ $(x+4)(x+1) = 0$
 $x+4=0$ $x+1=0$
 $x = -4, -1$

Solutions: $\begin{array}{r} x+4=0 \\ -4 \quad -4 \\ \hline x = -4 \end{array}$ $\begin{array}{r} -1 \quad -1 \\ 2x = -1 \\ \hline x = -\frac{1}{2} \end{array}$

$4x^2 = 4x - 1$

$\begin{array}{r} -4x+1 \\ -4x+1 \\ \hline 4x^2 - 4x + 1 = 0 \\ x^2 - 4x + 4 = 0 \\ (x-2)(x-2) = 0 \end{array}$

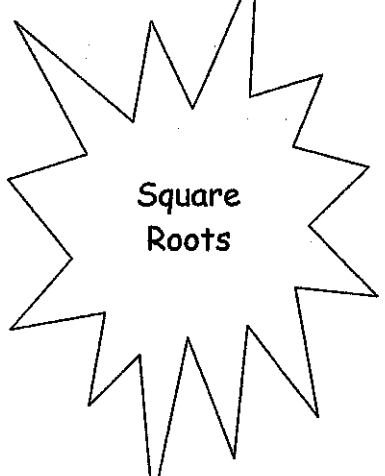
$x-2 = 0$
 $\begin{array}{r} +2 \quad +2 \\ \hline x = 2 \end{array}$

$3x^3 - 27x = 0$

$\begin{array}{r} 3x^3 \\ \hline 3x \end{array} - \begin{array}{r} 27x \\ \hline 3x \end{array} = 0$

$3x(x^2 - 9) = 0$
 $3x(x+3)(x-3) = 0$

$\begin{array}{r} 3x = 0 \\ \hline x = 0 \end{array}$ $\begin{array}{r} x+3=0 \\ -3 \quad -3 \\ \hline x = -3 \end{array}$ $\begin{array}{r} x-3=0 \\ \hline x = 3 \end{array}$



Square Roots

Procedure:

- ① Get x^2 or binomial squared by itself.
- ② Take the square root of both sides of equation.
 * remember to use \pm sign
- ③ Simplify

$4x^2 - 8 = 0$

$\begin{array}{r} +8 \quad +8 \\ \hline 4x^2 = 8 \\ \frac{4x^2}{4} = \frac{8}{4} \\ x^2 = 2 \\ \sqrt{x^2} = \pm\sqrt{2} \\ x = \pm\sqrt{2} \end{array}$

$8 - 2x^2 = -6$

$\begin{array}{r} 8 \quad -2x^2 \\ -8 \quad -8 \\ \hline -2x^2 = -14 \\ \frac{-2x^2}{-2} = \frac{-14}{-2} \\ x^2 = 7 \\ \sqrt{x^2} = \pm\sqrt{7} \\ x = \pm\sqrt{7} \end{array}$

$(2x - 3)^2 = 12$

$\sqrt{(2x-3)^2} = \pm\sqrt{12}$

$\begin{array}{r} 2x-3 = \pm 2\sqrt{3} \\ +3 \quad +3 \\ \hline 2x = 3 \pm 2\sqrt{3} \\ \frac{2x}{2} = \frac{3 \pm 2\sqrt{3}}{2} \\ x = \frac{3 \pm 2\sqrt{3}}{2} \end{array}$

Completing the Square

- Procedure:
- ① Move constant to other side
 - ② Add $(\frac{b}{2})^2$ to both sides
 - ③ Factor left, simplify right
 - ④ Take square root of both sides (use \pm on right)
 - ⑤ Solve for X

$$x^2 - 4x + 6 = 0$$

$$x^2 - 4x + 4 = -6 + 4$$

$$\sqrt{(x-2)^2} = \sqrt{10}$$

$$x-2 = \pm\sqrt{10}$$

$$x = 2 \pm \sqrt{10}$$

$$\left(\frac{-4}{2}\right)^2 = 4$$

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

$$x^2 - 6x + 9 = -5 + 9$$

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

$$x-3 = \pm 2$$

$$x = 3 \pm 2$$

$$x = 5, 1$$

$$\left(\frac{-6}{2}\right)^2 = 9$$

$$x^2 - 8x + 21 = 6$$

$$x^2 - 8x + 16 = -15 + 16$$

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

$$x-4 = \pm 1$$

$$x = 4 \pm 1$$

$$x = 5, 3$$

$$\left(\frac{-8}{2}\right)^2 = 16$$

Quadratic Formula

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

- Procedure:
- ① Rearrange into $ax^2 + bx + c = 0$
 - ② identify $a =$ $b =$ $c =$
 - ③ Plug a, b, c into formula
 - ④ Simplify by starting with radical

$$6x^2 + 4x - 2 = 0$$

$$a = 6 \quad b = 4 \quad c = -2$$

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

$$x = \frac{-4 \pm \sqrt{16 + 48}}{12}$$

$$x = \frac{-4 \pm \sqrt{64}}{12} = \frac{-4 \pm 8}{12}$$

$$x = \frac{-4+8}{12} = \frac{4}{12} = \frac{1}{3}$$

$$x = \frac{-4-8}{12} = \frac{-12}{12} = -1$$

$$3x^2 = 6x - 2$$

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

$$a = 3 \quad b = -6 \quad c = 2$$

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

$$x = \frac{6 \pm \sqrt{36 - 24}}{6}$$

$$x = \frac{6 \pm \sqrt{12}}{6} = \frac{6 \pm 2\sqrt{3}}{6}$$

$$x = \frac{6 \pm 2\sqrt{3}}{6} = 1 \pm \frac{\sqrt{3}}{3}$$

$$16 = 3x - 4x^2$$

$$4x^2 + 16 = 3x$$

$$4x^2 - 3x + 16 = 0$$

$$a = 4 \quad b = -3 \quad c = 16$$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(4)(16)}}{2(4)}$$

$$x = \frac{3 \pm \sqrt{9 - 256}}{8} = \frac{3 \pm \sqrt{-247}}{8}$$

No Real Solution