Warm up

what does x = ?

Solve by factoring

1) $0 = x^2 + 3x - 28$

-28: $-4 \cdot 7$, $+3$

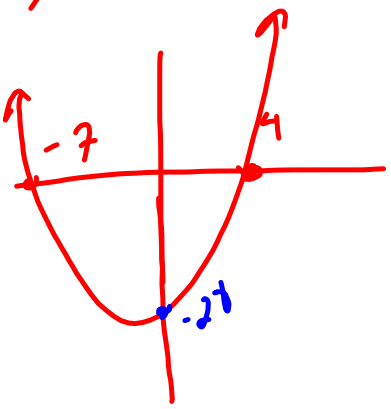
$0 = (x - 4)(x + 7)$

$x - 4 = 0$

$x = 4$

$x + 7 = 0$

$x = -7$



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

-30: $-5 \cdot 6$, $+1$

$\frac{(10x + 6)(10x - 5)}{10} = 0$

$\frac{2(5x + 3)(5)(2x - 1)}{10} = 0$

$(5x + 3)(2x - 1) = 0$

$5x + 3 = 0$

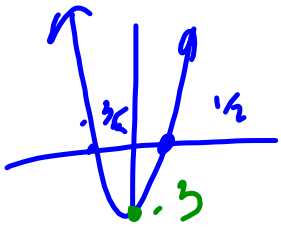
$\frac{5x}{5} = \frac{-3}{5}$

$x = -\frac{3}{5}$

$2x - 1 = 0$

$2x = 1$

$x = \frac{1}{2}$



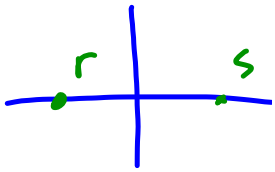
The Quadratic Formula

Quadratic equations are of the form $ax^2+bx+c=0$.

The roots of the quadratic equation correspond to the x intercepts (zeros).

We have solved quadratic equations by

- Factoring
  - $y=a(x-r)(x-s)$
    - $x=r$
    - $x=s$



If we cannot solve $0 = ax^2 + bx + c$ by factoring, we can use...

The Quadratic Formula

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

MEMORIZE

Solve using the quadratic formula. List a, b & c before substituting into formula.

1) $x^2 - 5x - 6 = 0$

$a = 1$
$b = -5$
$c = -6$

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

$$= \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(-6)}}{2(1)}$$

$$= \frac{5 \pm \sqrt{25 + 24}}{2}$$

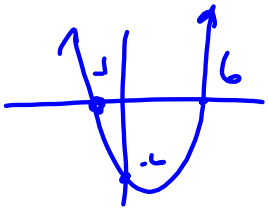
$$= \frac{5 \pm \sqrt{49}}{2}$$

$$= \frac{5 \pm 7}{2}$$

$x = \frac{5+7}{2}$ or $x = \frac{5-7}{2}$

$x = \frac{12}{2}$ $= \frac{-2}{2}$

$x = 6$ $x = -1$



Solve using the quadratic formula

1) $2x^2 - 7x = -3$

$2x^2 - 7x + 3 = 0$

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

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

$= \frac{7 \pm \sqrt{49 - 24}}{4}$

$= \frac{7 \pm 5}{4}$ OR $x = \frac{7-5}{4}$

$x = \frac{7+5}{4}$ $= \frac{2}{4}$

$x = \frac{12}{4}$ $x = \frac{1}{2}$

$x = 3$

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

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

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

$= \frac{-5 \pm \sqrt{25 + 16}}{2}$

$= \frac{-5 \pm \sqrt{41}}{2}$

$= \frac{-5 \pm 6.40}{2}$

$x = \frac{-5+6.40}{2}$ OR $x = \frac{-5-6.40}{2}$

$x = \frac{1.40}{2}$ $x = \frac{-11.40}{2}$

$x = 0.7$ $x = -5.7$

3) $3x^2 + 4x + 8 = 0$

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

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

$= \frac{-4 \pm \sqrt{16 - 96}}{6}$

$= \frac{-4 \pm \sqrt{-80}}{6}$ ← NOT possible

∴ No solution

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

$a = -1$

$b = 0$

$c = 5$

$x = \frac{-0 \pm \sqrt{(0)^2 - 4(-1)(5)}}{2(-1)}$

$= \frac{\pm \sqrt{20}}{-2}$

$= \frac{\pm 4.47}{-2}$

$x = \frac{4.47}{-2}$ OR $x = \frac{-4.47}{-2}$

$x = -2.2$ $x = 2.2$

5) $2.5x^2 + 14.2x - 5.8 = 0$

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

$= \frac{-14.2 \pm \sqrt{(14.2)^2 - 4(2.5)(-5.8)}}{2(2.5)}$

$\vdots$

$x = 0.38$ OR $x = -6.06$