

2.2 Factoring Part 2

ex: $x^2 - 7x + 10 = 0$

$$\begin{aligned} &x^2 - 5x - 2x + 10 \\ &x(x-5) - 2(x-5) \\ &\boxed{(x-2)(x-5)} \end{aligned}$$

$\begin{array}{c} 10x^2 \\ -5x \quad -2x \\ \hline \end{array}$

ex: $x^2 - x - 12 = 0$

$$\begin{aligned} &x^2 + 4x - 5x - 12 \\ &(x+4)(x-3) \end{aligned}$$

$\begin{array}{c} -12x^2 \\ -4x \quad 3x \\ \hline \end{array}$

ex: $x^2 + 8x + 12 = 0$

$$\begin{aligned} &x^2 + 6x + 2x + 12 \\ &(x+6)(x+2) \end{aligned}$$

$\begin{array}{c} 12x^2 \\ 6x \quad 2x \\ \hline \end{array}$

Factoring shortcut: The two numbers you find that add to the middle term are the numbers that end up in your factors.

* You can only use the shortcut when $a \neq 1$ (after you factor out the GCF) *

Standard Form
 $ax^2 + bx + c$

1) At $2x^2 - 6x - 80 = 0$

$$\begin{aligned} &2(x^2 - 3x - 40) = 0 \\ &\text{Shortcut: } 2(x-8)(x+5) = 0 \end{aligned}$$

$\begin{array}{c} -40x^2 \\ -8x \quad 5x \\ \hline \end{array}$

$\boxed{x=8} \quad \boxed{x=-5}$

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

$$\begin{aligned} &x(x^2 + 2x - 8) = 0 \\ &x(x+4)(x-2) = 0 \end{aligned}$$

$\begin{array}{c} -8x^2 \\ 4x \quad -2x \\ \hline \end{array}$

$\boxed{x=0} \quad \boxed{x=-4} \quad \boxed{x=2}$

* If x is out front as a GCF, one of your solutions will be $x=0$

- Fundamental Theorem of Algebra - the degree (highest exponent) of the equation tells you how many solutions there are

ex: $x^3 + 4x^2 - 2x + 1 = 0$ has 3 solutions

$x^2 - 5 = 0$ has 2 solutions

If $a \neq 1$, you factor like we did last time (factoring by grouping).

2) At $2n^2 - 7n - 4 = 0$

$$\begin{aligned} &2n^2 + 1n - 8n - 4 = 0 \\ &n(2n+1) - 4(2n+1) = 0 \\ &(n-4)(2n+1) = 0 \end{aligned}$$

$\begin{array}{c} -8n \\ n \quad -8n \\ \hline \end{array}$

$\boxed{n=4} \quad \boxed{n = -\frac{1}{2}}$

$2n+1=0$
 $2n=-1$
 $n = -\frac{1}{2}$

Solving shortcut from $(x-1)(3x+4) = 0$

Take the opposite,

then divide by

the coefficient in front of x

ex: $(2x-7)(6x+1) = 0$

$\begin{array}{c} x=\frac{7}{2} \quad x=-\frac{1}{6} \\ \hline \end{array}$

- Difference of Squares - use placeholder of 0, or take square root

3) At $x^2 - 9 = 0$

$$\begin{aligned} &(x^2 + 0x - 9) = 0 \\ &(x+3)(x-3) = 0 \end{aligned}$$

$\begin{array}{c} -9x^2 \\ 3x \quad -3x \\ \hline \end{array}$

$\boxed{x=-3} \quad \boxed{x=3}$

B) $x^2 - 25 = 0$

$$\begin{aligned} &\sqrt{x^2} = x \quad \sqrt{25} = 5 \\ &(x+5)(x-5) = 0 \end{aligned}$$

$\begin{array}{c} \sqrt{25} \\ x+5 \quad x-5 \\ \hline \end{array}$

$\boxed{x=-5} \quad \boxed{x=5}$

* This only works for a difference - subtraction

C) $16x^2 - 1 = 0$

$$\begin{aligned} &\sqrt{16x^2} = 4x \quad \sqrt{1} = 1 \\ &(4x+1)(4x-1) = 0 \end{aligned}$$

$\begin{array}{c} \sqrt{16x^2} \\ 4x+1 \quad 4x-1 \\ \hline \end{array}$

$\boxed{x=-\frac{1}{4}} \quad \boxed{x=\frac{1}{4}}$