Trinomial Expansions

Ex1 $(2x+1)(x+2)(3x+4)$

$$= \left[2x^2 + x + 4x + 2\right](3x+4)$$

$$= \left[2x^2 + 5x + 2\right](3x+4)$$

$$= 6x^3 + 15x^2 + 6x$$
$$\quad + 8x^2 + 20x + 8$$

$$= 6x^3 + 23x^2 + 26x + 8$$

Ex2 $(2x-3)(3x+1)(4x-5)$

$$= \left[6x^2 - 9x + 2x - 3\right](4x-5)$$

$$= \left[6x^2 - 7x - 3\right](4x-5)$$

$$= 24x^3 - 28x^2 - 12x$$
$$\quad - 30x^2 + 35x + 15$$

$$= 24x^3 - 58x^2 + 23x + 15$$

Exercise

1) $(x+3)(2x+3)(x+5)$

$= [2x^2+6x+3x+9](x+5)$

$= [2x^2+9x+9](x+5)$

$$\begin{aligned} = \quad & 2x^3 + 9x^2 + 9x \\ & \quad + 10x^2 + 45x + 45 \\ \hline = \quad & 2x^3 + 19x^2 + 54x + 45 \end{aligned}$$

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

$= [4x^2-6x+10x-15](x+1)$

$= [4x^2+4x-15](x+1)$

$$\begin{aligned} = \quad & 4x^3 + 4x^2 - 15x \\ & \quad + 4x^2 + 4x - 15 \\ \hline = \quad & 4x^3 + 8x^2 - 11x - 15 \end{aligned}$$

3) $(2x-1)(3x-2)(4x-3)$

$= [6x^2-3x-4x+2](4x-3)$

$= [6x^2-7x+2](4x-3)$

$$\begin{aligned} = \quad & 24x^3 - 28x^2 + 8x \\ & \quad - 18x^2 + 21x - 6 \\ \hline \end{aligned}$$

$= 24x^3 - 46x^2 + 29x - 6$

Completing the Square

$(x+a)^2$
$= (x+a)(x+a)$
$= x^2 + 2ax + a^2$

Ex1

$$x^2 + 6x + 5$$
$$= (x+3)^2 + 5 - 9$$
$$= (x+3)^2 - 4$$

Ex2

$$x^2 - 8x + 20$$
$$= (x-4)^2 + 20 - 16$$
$$= (x-4)^2 + 4$$

Ex3

$$x^2 + 5x + 10$$
$$= \left(x + \tfrac{5}{2}\right)^2 + 10 - \tfrac{25}{4}$$
$$= \left(x + \tfrac{5}{2}\right)^2 + \tfrac{40}{4} - \tfrac{25}{4}$$
$$= \left(x + \tfrac{5}{2}\right)^2 + \tfrac{15}{4}$$

Exercise Complete the Squares

1) $x^2 + 10x + 3$
$= (x+5)^2 + 3 - 25$

$$= (x+5)^2 - 22$$

2) $$x^2 - 9x - 1$$

$$= \left(x - \tfrac{9}{2}\right)^2 - 1 - \tfrac{81}{4}$$

$$= \left(x - \tfrac{9}{2}\right)^2 - \tfrac{4}{4} - \tfrac{81}{4}$$

$$= \left(x - \tfrac{9}{2}\right)^2 - \tfrac{85}{4}$$

3) $$x^2 + x + 7$$

$$= \left(x + \tfrac{1}{2}\right)^2 + 7 - \tfrac{1}{4}$$

$$= \left(x + \tfrac{1}{2}\right)^2 + \tfrac{28}{4} - \tfrac{1}{4}$$

$$= \left(x + \tfrac{1}{2}\right)^2 + \tfrac{27}{4}$$

4) $$x^2 - 2x + 3$$

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

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

Translations of Graphs

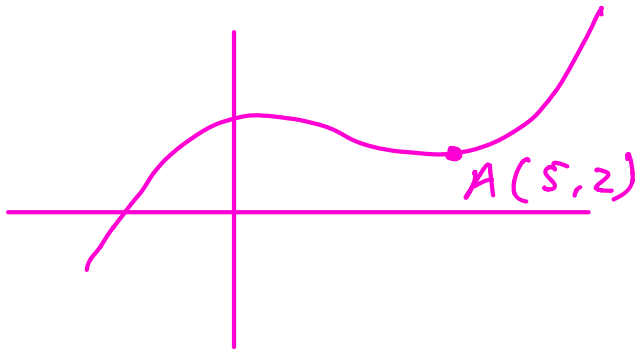
if $y = f(x)$

$y = f(x-a)$ is a translation by $\begin{pmatrix} a \\ 0 \end{pmatrix}$

$y = f(x) + b$ is a translation by $\begin{pmatrix} 0 \\ b \end{pmatrix}$

$y = f(x-a) + b$ is a translation by $\begin{pmatrix} a \\ b \end{pmatrix}$

Let $y = f(x)$



What is the image of A on the graph

1) $y = f(x-3) + 7$

Image of A $= (5+3, 2+7)$

$= (8, 9)$

2) $y = f(x+1) + 3$

Image of A $= (5-1, 2+3)$

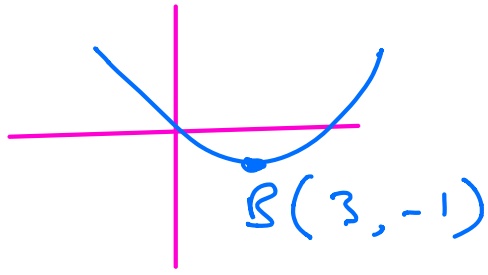
$= (4, 5)$

3) $y = f(x+\frac{1}{2}) - \frac{1}{2}$

Image A $= (5-\frac{1}{2}, 2-\frac{1}{2})$

$= \left(\frac{9}{2}, \frac{3}{2}\right)$

Exercise $\quad y = f(x)$



Find image of B

$y = f(x+2) + 3$

Image of B $= (3-2, -1+3)$

$= (1, 2)$

$y = f(x) = x^2$

$y = f(x-3) + 4$

What happens to c the origin

$(0,0) \rightarrow (3,4)$