Mathematics 10D

6.3 – Completing the Square

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$$(x+3)^2 = x^2+6x+9$$

$$y = a(x-h)^2 + k$$

perfect square

$$x^2+10x+25 = (x+5)^2$$

$$x^2+14x+\boxed{49} = (x+7)^2$$

$$x^2-22x+\boxed{121} = (x-11)^2$$

$$x^2+3x+\boxed{2.25} = (x+1.5)^2$$

$$x^2+bx+c$$

$$c = \left(\frac{b}{2}\right)^2$$

Convert from Standard to Vertex by completing the square:

$$y = 2x^2 + 12x - 5$$

$$y = 2(x^2 + 6x + 0) - 5$$

P.F. $\frac{6}{2} = 3$, $3^2 = 9$

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

So

$$y = 2(x^2 + 6x + 9) - 5 - 18$$

④ factor simplify

① Factor a from the first two terms.

② Complete the square, adding and subtracting that value

③ multiply a by the negative #

$$y = 2(x+3)^2 - 23$$

vertex is $(-3, -23)$

this is a Minimum

Optimal value is the lowest/highest value on a parabola.

O.V. $= -23$

$$y = -5x^2 - 40x + 71$$

$$y = -5(x^2 + 8x + 0) + 71$$

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

$$y = -5(x^2 + 8x + 16 - 16) + 71$$

$+80$

$$y = -5(x+4)^2 + 151$$

vertex $(-4, 151)$ O.V. is 151

$$y = \frac{1}{2}x^2 - 5x + 14$$

$$y = \frac{1}{2}(x^2 - 10x + 0) + 14$$

$$\left(\frac{10}{2}\right)^2 = 25$$

$$y = \frac{1}{2}(x^2 - 10x + 25 - 25) + 14$$

-12.5

$$y = \frac{1}{2}(x-5)^2 + 1.5$$

Vertex is $(5, 1.5)$

O.V. is 1.5

$$y = 2.84x^2 - 8.23x + 5.4$$

$$y = 2.84(x^2 - 2.898x + 0) + 5.4$$

$$y = 2.84(x^2 - 2.898x + 2.099 - 2.099) + 5.4$$

$$y = 2.84(x - 1.449)^2 - 0.561$$

$\therefore$ Vertex is $(1.449, -0.561)$