Mathematics 10D

Q.05 – Completing the Square

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Q.05 – Completing the Square → allows you to convert standard to vertex form.

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

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

$(x - 7)^2 = x^2 - 14x + 49$

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

$(x - 174)^2 = x^2 - 348x + 30276$

$(x - 16.5)^2 = x^2 - 33x + 272.25$

$(x - 1.42)^2 = x^2 - 2.84x + 2.0164$

Convert from Standard form to Vertex form by completing the square, then state the vertex.

$y = 2x^2 + 12x - 5$ (2 = a)

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

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

Perfect square!!

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

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

① Factor the "a" from the first two terms.

② Find the missing term to complete the perfect square.
→ $\frac{6}{2} = 3$, $3^2 = 9$

③ Multiply the "a" with −9 and move it to the end.

④ Rewrite the P.S as $(x-h)^2$ and simplify the end.

Let's do another!

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

-5

$\frac{8}{2} = 4, \quad 4^2 = 16$

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

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

$$y = -5(x^2 + 8x + 16) + 71 + 80$$

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

What happens when *a* is a fraction?

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

$\frac{1}{2}$

$\frac{-10}{2} = -5, \quad (-5)^2 = 25$

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

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

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

$\frac{28}{2} - \frac{25}{2} = \frac{3}{2}$

$y = \frac{1}{2}(x - 5)^2 + \frac{3}{2}$

Uh oh, we have decimals! No worries!

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

2.84

$$\frac{-2.898}{2} = 1.449$$

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

$$(1.449)^2 = 2.0996$$

$$y = 2.84(x^2 - 2.898x + 2.0996 - 2.0996) + 5.4$$

$$y = 2.84(x^2 - 2.898x + 2.0996) + 5.4 - 5.963$$

$$y = 2.84(x - 1.449)^2 - 0.563$$