Sec. 3.3: Completing the Square

Vertex form $\longrightarrow$ Standard form

$y = 2(x-1)^2 + 4 \longrightarrow y = 2x^2 - 4x + 6$

$$y = 2(x^2 - 2x + 1) + 4$$
$$= 2x^2 - 4x + 2 + 4$$
$$= 2x^2 - 4x + 6$$

* Completing the square is used to change the standard form to the vertex form by creating a perfect square trinomial.

ex.1) $y = (x^2 + 6x) + 1$

$$y = (x^2 + 6x + 9) + 1 - 9$$

$\frac{1}{2}$ of 6 & square it

$$y = (x+3)^2 - 8$$

Check: $y = (x+3)(x+3) - 8$

$$= x^2 + 3x + 3x + 9 - 8$$
$$= x^2 + 6x + 1$$

2. $y = (x^2 - 12x) - 4$

$$y = (x^2 - 12x + 36) - 4 - 36$$

$$y = (x-6)^2 - 40$$

3. $y=(2x^2+4x)-3$

factor out 2

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

+2

$y=2(x+1)^2-5$

4. $y=(3x^2-18x)+7$

$y=3(x^2-6x+9)+7-27$

27

$y=3(x-3)^2-20$

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

$y=-2(x^2+8x+16)-8+32$

-32

$y=-2(x+4)^2+24$

Practice:

1. $y=x^2-10x-6$

2. $y=4x^2+16x+3$

3. $y=-5x^2+30x+1$

4. $y=\frac{1}{2}x^2-5x-2$

5. $y=-2x^2+10x-1$