Working in Standard Form Part 2

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A. Definitions

1. **general form:** any quadratic function that can be written in the form:
$y = ax^2 + bx + c$ or $f(x) = ax^2 + bx + c$.

2. **standard form:** any quadratic function that can be written in the form:
$y = a(x - p)^2 + q$ or $f(x) = a(x - p)^2 + q$

3. **perfect square trinomial:** a trinomial that has two equal factors.

4. **completing the square:** a method of solving a quadratic equation that is not easily factored.

B. Writing a Quadratic Function in Standard Form

In order to take a quadratic function in General Form and change it into Standard Form we need to complete the square. This method is similar the one taught when we solved a quadratic equation.

1) Write the following equations in Standard Form $y = a(x - p)^2 + q$, and determine the coordinates of the vertex.
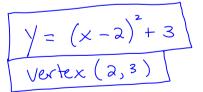
a) $y = x^2 - 4x + 7$

$$y - 7 = x^2 - 4x$$

$$y - 7 = x^2 - 4x + 4$$
$$ + 4$$

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

$$\boxed{y = (x - 2)^2 + 3}$$

$$\boxed{\text{Vertex } (2, 3)}$$

b) $y = 2x^2 + 8x - 5$

$+5 \qquad +5$

$y + 5 = 2x^2 + 8x$

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

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

$+8$

$y + 13 = 2(x + 2)^2 - 13$

-13

$$\boxed{y = 2(x + 2)^2 - 13}$$
$$\boxed{\text{Vertex } (-2, -13)}$$

c) $y = \dfrac{1}{2}x^2 - 6x - 10$

$+10 \qquad +10$

$y + 10 = \dfrac{1}{2}x^2 - 6x$

$y + 10 = \dfrac{1}{2}(x^2 - 12x)$

$y + 10 = \dfrac{1}{2}(x^2 - 12x + 36)$

$+18$

$y + 28 = \dfrac{1}{2}(x - 6)^2 - 28$

-28

$$\boxed{y = \dfrac{1}{2}(x - 6)^2 - 28}$$
$$\boxed{\text{Vertex } (6, -28)}$$

d) $y = -2x^2 + 7x - 11$

$+11 \qquad +11$

$y + 11 = -2x^2 + 7x$

$y + 11 = -2\left(x^2 - \dfrac{7}{2}x\right)$

$y + 11 = -2\left(x^2 - \dfrac{7}{2}x + \dfrac{49}{16}\right)$

$-\dfrac{49}{8}$

$y + \dfrac{39}{8} = -2\left(x - \dfrac{7}{4}\right)^2 - \dfrac{39}{8}$

$-\dfrac{39}{8}$

$$\boxed{y = -2\left(x - \dfrac{7}{4}\right)^2 - \dfrac{39}{8}}$$
$$\boxed{\text{Vertex } \left(\dfrac{7}{4}, -\dfrac{39}{8}\right)}$$

Assignment: Working in Standard Form Part 2 Assignment #1 – 8

PRE-CALCULUS 11
QUADRATIC FUNCTIONS
WORKING IN STANDARD FORM PART 2 ASSIGNMENT

A. Change each of the following Quadratic Functions into Standard Form $y = a(x-p)^2 + q$.

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

2) $y = 3x^2 - 12x - 5$

3) $y = -5x^2 - 20x - 9$

4) $y = 2x^2 + 3x - 5$

5) $y = 4x^2 + 8x + 3$

6) $y = -3x^2 - 2x - 10$

7) $y = \frac{1}{2}x^2 + 4x - 9$

8) $y = -\frac{1}{3}x^2 - 2x + 11$

Answers

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

2) $y = 3(x-2)^2 - 17$

3) $y = -5(x+2)^2 + 11$

4) $y = 2\left(x + \dfrac{3}{4}\right)^2 - \dfrac{49}{8}$

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

6) $y = -3\left(x + \dfrac{1}{3}\right)^2 - \dfrac{29}{3}$

7) $y = \dfrac{1}{2}(x+4)^2 - 17$

8) $y = -\dfrac{1}{3}(x+3)^2 + 14$