

Name: \_\_\_\_\_

9th Grade Math Worksheet  
Quadratic Functions in Vertex and Standard Form

Teacher : Aseel Zaghloul

### Part 1: Understanding the Standard Form and Vertex Form.

The **standard form** of a quadratic function is:

$$f(x) = ax^2 + bx + c$$

Where:

- $a$ ,  $b$ , and  $c$  are constants, and
- The graph of the quadratic function is a **parabola**.

The **vertex form** of a quadratic function is:

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

Where:

- $(h, k)$  is the **vertex** of the parabola.

### Part 2: Identify the Vertex and Determine the Direction of the Parabola.

For each of the following quadratic functions in **standard form**, do the following:

1. Write the function in **vertex form**.
2. Identify the **vertex** of the parabola.
3. Determine whether the parabola opens **up** or **down** based on the value of  $a$ .

1.  $f(x) = 2x^2 + 8x + 3$

- Vertex form: \_\_\_\_\_
- Vertex: \_\_\_\_\_
- Direction: \_\_\_\_\_



2.  $f(x) = -x^2 + 4x - 1$

- Vertex form: \_\_\_\_\_
- Vertex: \_\_\_\_\_
- Direction: \_\_\_\_\_

3.  $f(x) = 3x^2 - 12x + 5$

- Vertex form: \_\_\_\_\_
- Vertex: \_\_\_\_\_
- Direction: \_\_\_\_\_

4.  $f(x) = -2x^2 + 8x + 6$

- Vertex form: \_\_\_\_\_
- Vertex: \_\_\_\_\_
- Direction: \_\_\_\_\_

5.  $f(x) = 4x^2 - 16x + 7$

- Vertex form: \_\_\_\_\_
- Vertex: \_\_\_\_\_
- Direction: \_\_\_\_\_

### Part 3: Converting from Vertex Form to Standard Form

For each of the following quadratic functions in **vertex form**, convert the function to **standard form**.

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

- Standard form: \_\_\_\_\_

2.  $f(x) = -2(x + 1)^2 + 5$

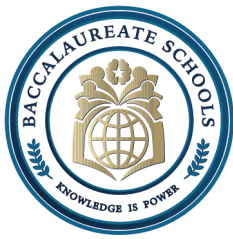
- Standard form: \_\_\_\_\_

3.  $f(x) = 4(x - 3)^2 - 7$

- Standard form: \_\_\_\_\_

4.  $f(x) = -3(x + 2)^2 + 1$

- Standard form: \_\_\_\_\_



#### Part 4: Finding the Vertex from the Standard Form

For the following quadratic functions in **standard form**, find the vertex. (You can use the formula  $h = \frac{-b}{2a}$  to find the x-coordinate of the vertex, and then substitute  $x = h$  into the function to find the y-coordinate).

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

• Vertex: \_\_\_\_\_

2.  $f(x) = -3x^2 + 12x + 1$

• Vertex: \_\_\_\_\_

3.  $f(x) = 5x^2 - 20x + 8$

• Vertex: \_\_\_\_\_

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

• Vertex: \_\_\_\_\_