Objective: Write a quadratic function in vertex form. Transform a quadratic function using vertex form.

### STANDARD FORM OF A QUADRATIC FUNCTION:
\[ y = ax^2 + bx + c \]

| y-intercept: | 
|---|---|
| Axis of Symmetry: | 
| Vertex: | 
| Pattern: | 

### VERTEX FORM OF A QUADRATIC FUNCTION:
\[ y = a(x - h)^2 + k \]

| y-intercept: | 
|---|---|
| Axis of Symmetry: | 
| Vertex: | 
| Pattern: | 

#### Transformations:

\[ f(x) = a(x + h)^2 + k \]

**Horizontal Translations (Slides)**

- When \( h \) is positive \( h \) units ________
- When \( h \) is negative \( h \) units ________

**Vertical Translations (Slides)**

- When \( k \) is positive \( k \) units ________
- When \( k \) is negative \( k \) units ________

**Vertical Reflections (Flips)**

- When \( a \) is positive opens ______
- When \( a \) is negative opens ______ reflection over __________

**Dilations (Expansions / Compressions)**

- When \(|a| > 1\) Expands vertically by ________
- When \(0 < |a| < 1\) Compresses vertically by ________
Example 1: Write each quadratic function in vertex form, if not already in that form. Then identify the vertex, axis of symmetry and direction of opening.

A) \( y = -2(x - 1)^2 + 4 \)

Transformation: ________________________________________________________

Vertex: ___________ Axis of Symmetry: ___________ Direction of Opening: ___________

B) \( f(x) = x^2 + 4x - 1 \)

Transformation: ________________________________________________________

Vertex: ___________ Axis of Symmetry: ___________ Direction of Opening: ___________

C) \( y = 2x^2 + 12x + 15 \)

Transformation: ________________________________________________________

Vertex: ___________ Axis of Symmetry: ___________ Direction of Opening: ___________
Example 2: Write the equation for the parabola with the given vertex that passes through the given point.

A) VERTEX: \((0, 5)\)
POINT THE PARABOLA PASSES THROUGH: \((3, 8)\)

B) VERTEX: \((6, 1)\)
POINT THE PARABOLA PASSES THROUGH: \((7, 10)\)

C) VERTEX: \((-3, 6)\)
POINT THE PARABOLA PASSES THROUGH: \((-5, 2)\)
Write each quadratic function in vertex form, if not already in that form.

1) \( y = 3(x - 4)^2 - 6 \)

Transformation: ________________________________________________________

Vertex: ___________ Axis of Symmetry: ___________ Direction of Opening: _______

2) \( y = x^2 + 8x + 16 \)

Transformation: ________________________________________________________

Vertex: ___________ Axis of Symmetry: ___________ Direction of Opening: _______

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

Transformation: ________________________________________________________

Vertex: ___________ Axis of Symmetry: ___________ Direction of Opening: _______

4) \( y = -2x^2 + 5 \)

Transformation: ________________________________________________________

Vertex: ___________ Axis of Symmetry: ___________ Direction of Opening: _______
5) \[ y = -3x^2 + 12x - 8 \]

Transformation: ________________________________________________________

Vertex: ___________  Axis of Symmetry: ___________  Direction of Opening: ________

6) \[ y = 2x^2 - 4x - 3 \]

Transformation: ________________________________________________________

Vertex: ___________  Axis of Symmetry: ___________  Direction of Opening: ________

Write the equation for the parabola with the given vertex that passes through the given point.

7)  
   Vertex: \((5, 4)\)  
   Point the parabola passes through: \((6, 1)\)

8)  
   Vertex: \((-3, 2)\)  
   Point the parabola passes through: \((-1, 8)\)

9)  
   Vertex: \((-4, 3)\)  
   Point the parabola passes through: \((-3, 6)\)
Write each quadratic function in vertex form, if not already in that form.

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

Transformation: ________________________________________________________

Vertex: ___________  Axis of Symmetry: ___________  Direction of Opening: _________

2) $y = x^2 + 8x + 14$

Transformation: ________________________________________________________

Vertex: ___________  Axis of Symmetry: ___________  Direction of Opening: _________

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

Transformation: ________________________________________________________

Vertex: ___________  Axis of Symmetry: ___________  Direction of Opening: _________