

Standard Form:  $y = ax^2 + bx + c$

Tells you...

- ① the direction the graph faces  
 [  $\uparrow$  a is positive  $\downarrow$  a is negative ]
- ② y-intercept [c-value]

Vertex Form:  $y = a(x-h)^2 + k$

Tells you...

- ① the direction the graph faces
- ② Vertex (h, k)  
 \* opposite # on inside, exact # on outside \*
- ③ All transformations

Intercept form:  $y = a(x-p)(x-q)$

Tells you...

- ① what direction the graph faces
- ② x-intercepts [p & q] \*solve factors\*

Transformation of Graphs: Shifting, Stretching, Shrinking, and Reflecting of graphs

Types:

Vertical or Horizontal shift

Reflection

Vertical Stretch or Shrink

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

Examples

Add outside  $y = x^2 + 3$   
MOVES UP

Subtract outside  $y = x^2 - 3$   
MOVES down

Add inside  $y = (x + 3)^2$   
MOVES left

Subtract inside  $y = (x - 3)^2$   
MOVES Right

Multiply by a negative (-)  $y = -x^2$

Causes the graph to  
\* reflect \*  
\* Flip \*  
\* fall down \*

\* inside opposite \*

Multiply by a fraction (less than 1)  $y = \frac{1}{4}x^2$   
\* wider \*

Causes the graph to  
SHRINK

Multiply by an integer  $y = 3x^2$   
\* skinnier \*

Causes the graph to  
STRETCH

Example: Find the vertex, direction, and Transformations of the Quadratic Equation.

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

V:  $(5, 4)$

Faces up

- Right 5
- up 4

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

V:  $(-3, -2)$

faces down

- reflects
- left 3
- down 2

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

V:  $(1, 3)$

faces down

- reflect
- Right 1
- up 3
- Stretch 3

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

V:  $(-3, -3)$

faces up

- left 3
- down 3
- Stretch 2

Write the equation given the transformations:

1) Shifted left 4 and down 2

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

2) Shifted right 8 and up 6

$$y = (x - 8)^2 + 6$$

3) Reflected over the x-axis and up 7

$$y = -(x)^2 + 7 \quad \text{or} \quad y = -x^2 + 7$$

4) Stretch of 3, right 6, and reflected over the x-axis

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