Bellwork: Complete the table of the function and identify whether it is linear, quadratic, absolute value, or exponential quadratic

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

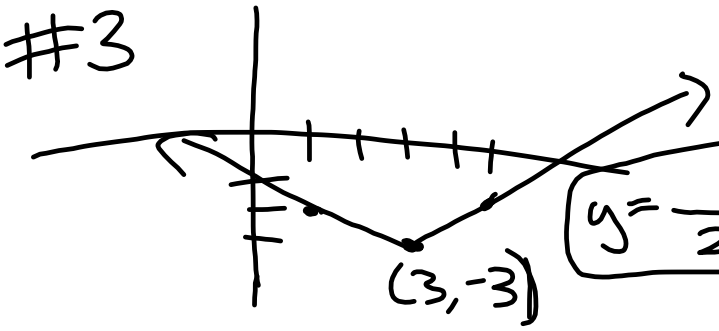
$y=(-2-1)^2+2$

$(-3)^2+2$

$9+2$

| x | y | | |
|---|---|---|---|
| -2 | 11 | -5 | |
| -1 | 6 | -3 | 2 |
| 0 | 3 | -1 | 2 |
| 1 | 2 | 1 | 2 |
| 2 | 3 | | |

#3




$y=\frac{1}{2}|x-3|-3$

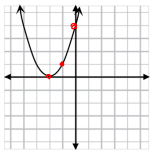
#6 $y=mx+b$ $y=-5x+15$

Homework 2.1 Solutions

1. Quadratic
2. None
3. Absolute value
4. Linear
5. Exponential
6. Linear
7. Exponential
8. Quadratic
9. None
10. Absolute value
11. None
12. Linear
13. Quadratic
14. Exponential
15. Absolute value

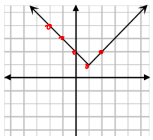
16.

| x | y |
|---|---|
| -2 | 0 |
| -1 | 1 |
| 0 | 4 |
| 1 | 9 |
| 2 | 16 |



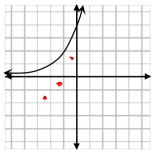
17.

| x | y |
|---|---|
| -2 | 4 |
| -1 | 3 |
| 0 | 2 |
| 1 | 1 |



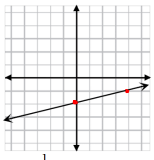
18.

| x | y |
|---|---|
| -2 | 1 |
| -1 | 2 |
| 0 | 4 |
| 1 | 8 |
| 2 | 16 |



19.

| x | y |
|---|---|
| -2 | -2.5 |
| -1 | -2.25 |
| 0 | -2 |
| 1 | -1.75 |
| 2 | -1.5 |



20. Equation for #3: $y = \frac{1}{2}|x-3|-3$

Equation for #6: $y = -5x+15$

# Lesson 2.2 Objectives:

**1. SWBAT interpret and use function notation.**

**2. SWBAT transform functions by translations, reflections, and/or dilations.**

# Function Notation

$f(x)$ means "function of $x$" (it does not mean $f$ times $x$)

$f(x)$ is used in place of $y$. Why?

It allows you to communicate what you want for input ($x$).

For example: If $f(x)=2x+8$ then $f(5)=2(5)+8$

## Example 1:

If $f(x)=|7-x|$, find:

a. $f(10) = |7-(10)| = |-3| = 3$

b. $f(0) = |7-(0)| = |7| = 7$

c. $f(-8) = |7-(-8)| = |15| = 15$

# Example 2:

If $f(x) = 2x^2 + 1$, find:

a. $f(5) = 2(5)^2 + 1 = 2(25) + 1 = 51$

b. $f(-3) = 2(-3)^2 + 1 = 19$

c. $f(n+1) = 2(n+1)^2 + 1$

$= 2(n^2 + 2n + 1) + 1$

$2n^2 + 4n + 2 + 1$

$2n^2 + 4n + 3$

$(n+1)(n+1)$

$n^2 + n + n + 1$

## Function Transformations

$F(x) = x^2$

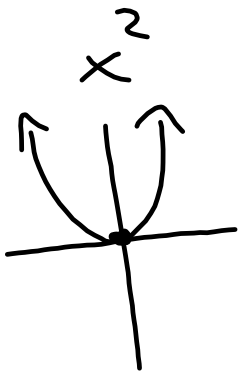
$(x-1)^2$

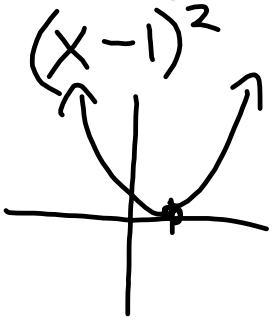
$(x+1)^2$

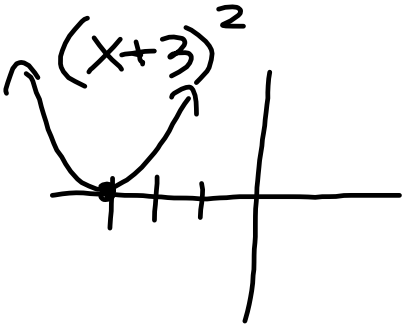
- Horizontal transformations

$f(x-h)$ translates (shifts) $f(x)$ to the right $h$ units

$f(x+h)$ translates (shifts) $f(x)$ to the left $h$ units



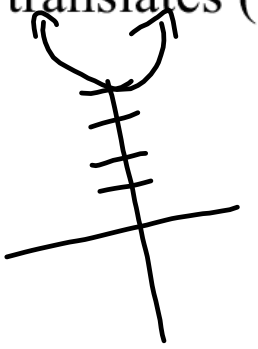
# Function Transformations

- Vertical transformations

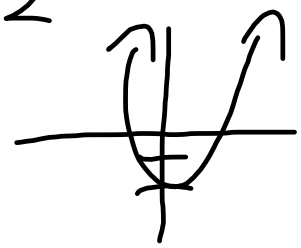
$f(x)+v$ translates (shifts) $f(x)$ up $v$ units

$f(x)-v$ translates (shifts) $f(x)$ down $v$ units

$x^2+4$



$x^2-2$



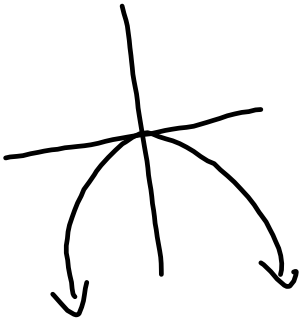
# Function Transformations

- Reflection Transformations

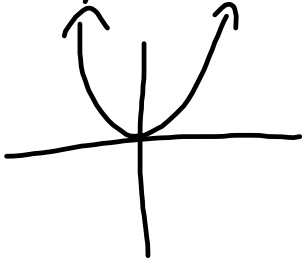
$-f(x)$ reflects $f(x)$ in $x$-axis (up-down flip)

$f(-x)$ reflects $f(x)$ in $y$-axis (left-right flip)

$-x^2$



$(-x)^2$



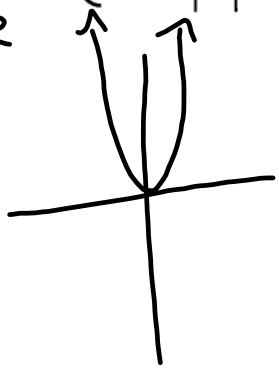
# Function Transformations

- Stretch Transformations

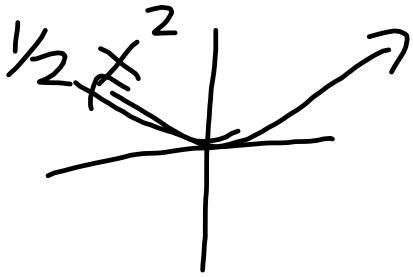
$a \cdot f(x)$ dilates $f(x)$ vertically.

$$\begin{cases} \text{If } |a| > 1, \text{ then there's a vertical stretch.} \\ \text{If } |a| < 1, \text{ then there's a vertical shrink.} \end{cases}$$

$2 \cdot x^2$



$\frac{1}{2}x^2$



## Example 3

Describe how each function below is transformed compared to $f(x) = x^2$

a. $f(x) = (x-3)^2$

shifts right 3

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

shifts up 6

reflects over x-axis (up-down flip)

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

vertical stretch of 2

shifts left 1

shifts down 8

# Example 4

Describe how each function below is transformed compared to $f(x)=|x|$

a. $f(x)=\frac{1}{3}|x|$ (1/3 f(x))

vertical shrink of 1/3

b. $f(x)=-3|x+1|$

reflects over x-axis (up-down flip)

vertical stretch of 3

translate left 1

c. $f(x)=|-x|-11$

reflect over y-axis (left-right flip)

translates down 11