



Parent Functions  
and  
Transformations

A collection of colorful school supplies including a protractor, ruler, and pencil sharpener. The background features a yellow ruler, a blue ruler, a pink and purple protractor, and a blue pencil sharpener. A green ruler is visible at the bottom. A dark green rounded rectangle is overlaid on the supplies, containing the text "Parent Functions" in white.

# Parent Functions

# Constant Function

$$f(x) = a$$

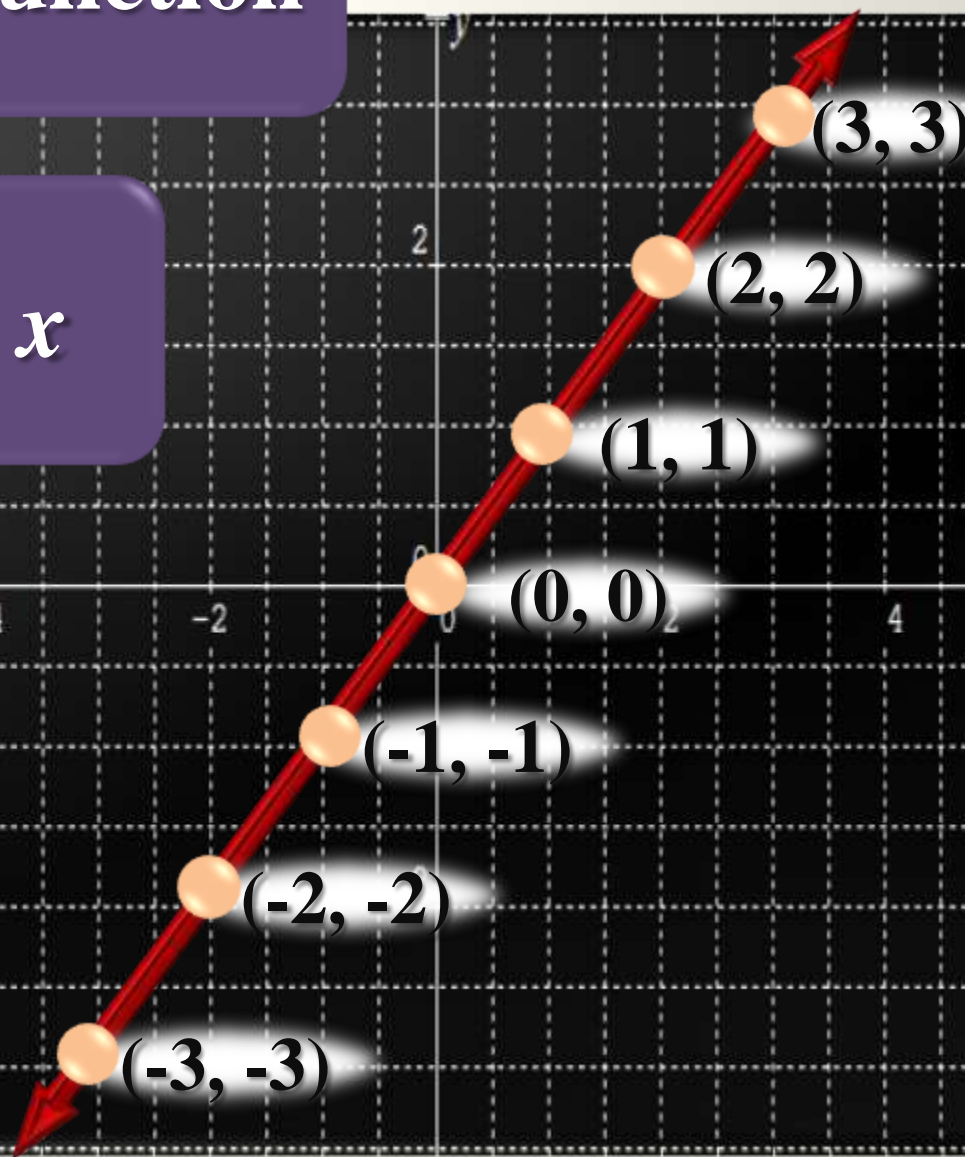

$$f(x) = 1$$

**Domain:**  
 $\{ \text{all real numbers} \}$

**Range:**  
A single real  
number ( $a$ )

# Identity Function

$$f(x) = x$$





# Identity Function

Is the parent  
function

Of most  
Linear Functions



Domain:  
{ all real numbers }

Range:  
{ all real numbers }

# Absolute Value Function

$$f(x) = |x|$$

-6

-4

-2

0

2

4

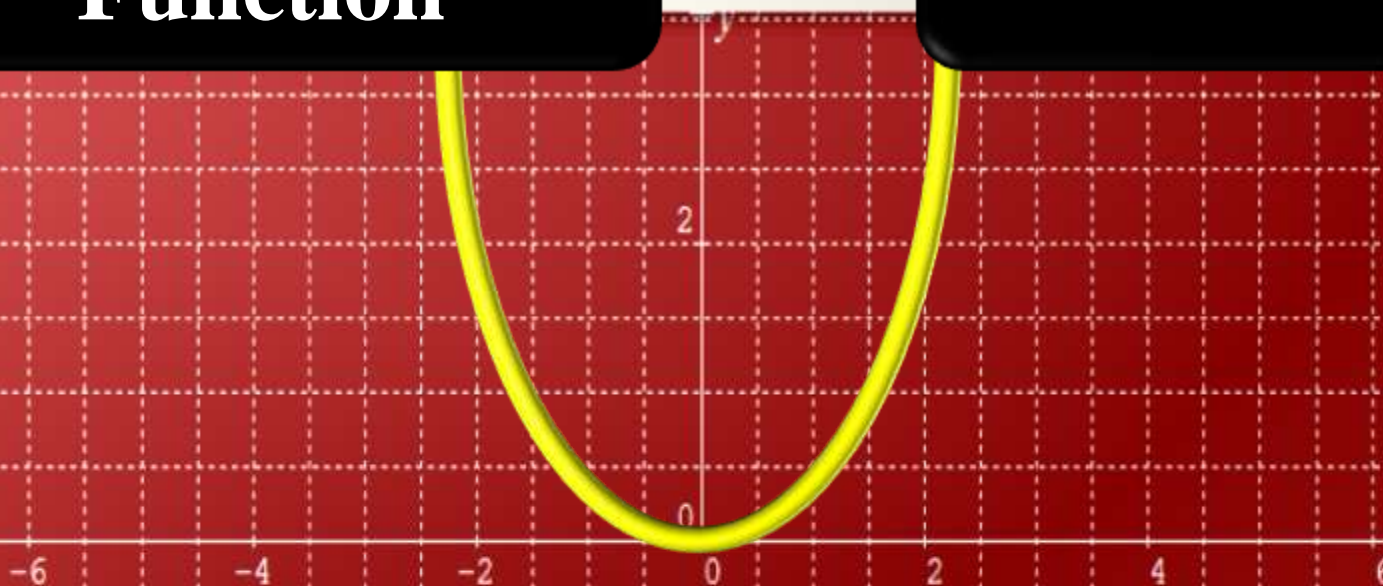
6

**Domain:**  
 $\{ \text{all real numbers} \}$

**Range:**  
 $\{ y \mid y \geq 0 \}$

# Quadratic Function

$$f(x) = x^2$$



**Domain:**  
**{ all real numbers }**

**Range:**  
**{  $y \mid y \geq 0$  }**



# Transformations



# Translation

**Vertical  
Translation**

$$f(x) \pm k$$

$$f(x) = x + 2$$

**2 units up**

$$f(x) = x^2 - 4$$

**4 units down**

$$f(x) = |x| + 5$$

**5 units up**

# Translation

**Horizontal  
Translation**

$$f(x \pm h)$$

$$f(x) = (x + 1)$$

**1 unit to left**

$$f(x) = (x^2 - 5)$$

**5 units to right**

$$f(x) = |x + 3|$$

**3 units to left**

# Translation

**Vertical  
Translation**

$$f(x) \pm k$$

$+k$

**Up** ↑

$-k$

**Down** ↓

**Horizontal  
Translation**

$$f(x \pm h)$$

$+h$

**Left** ←

$-h$

**Right** →

# Translation

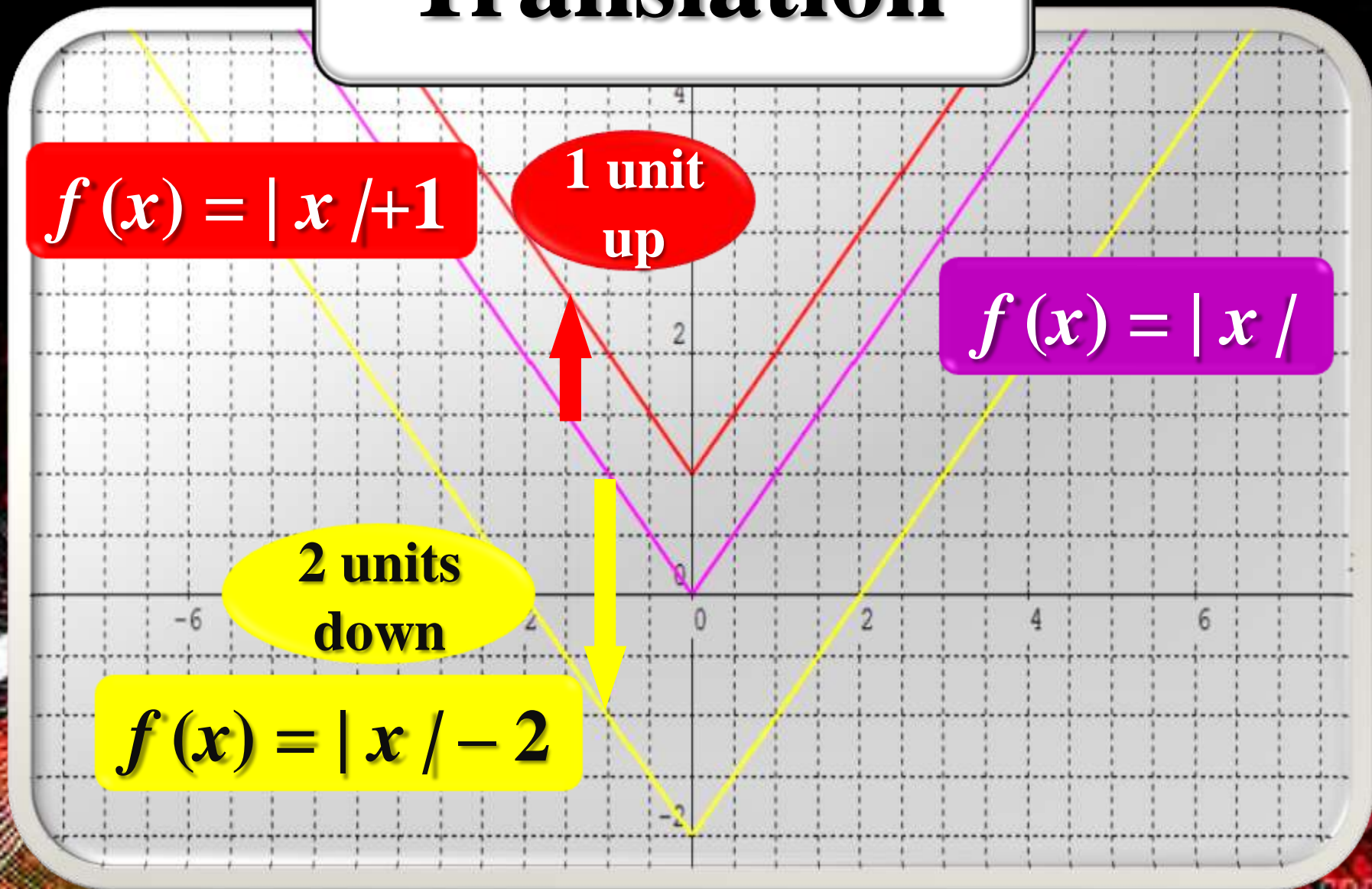
$$f(x) = |x| + 1$$

1 unit  
up

$$f(x) = |x|$$

2 units  
down

$$f(x) = |x| - 2$$



# Translation

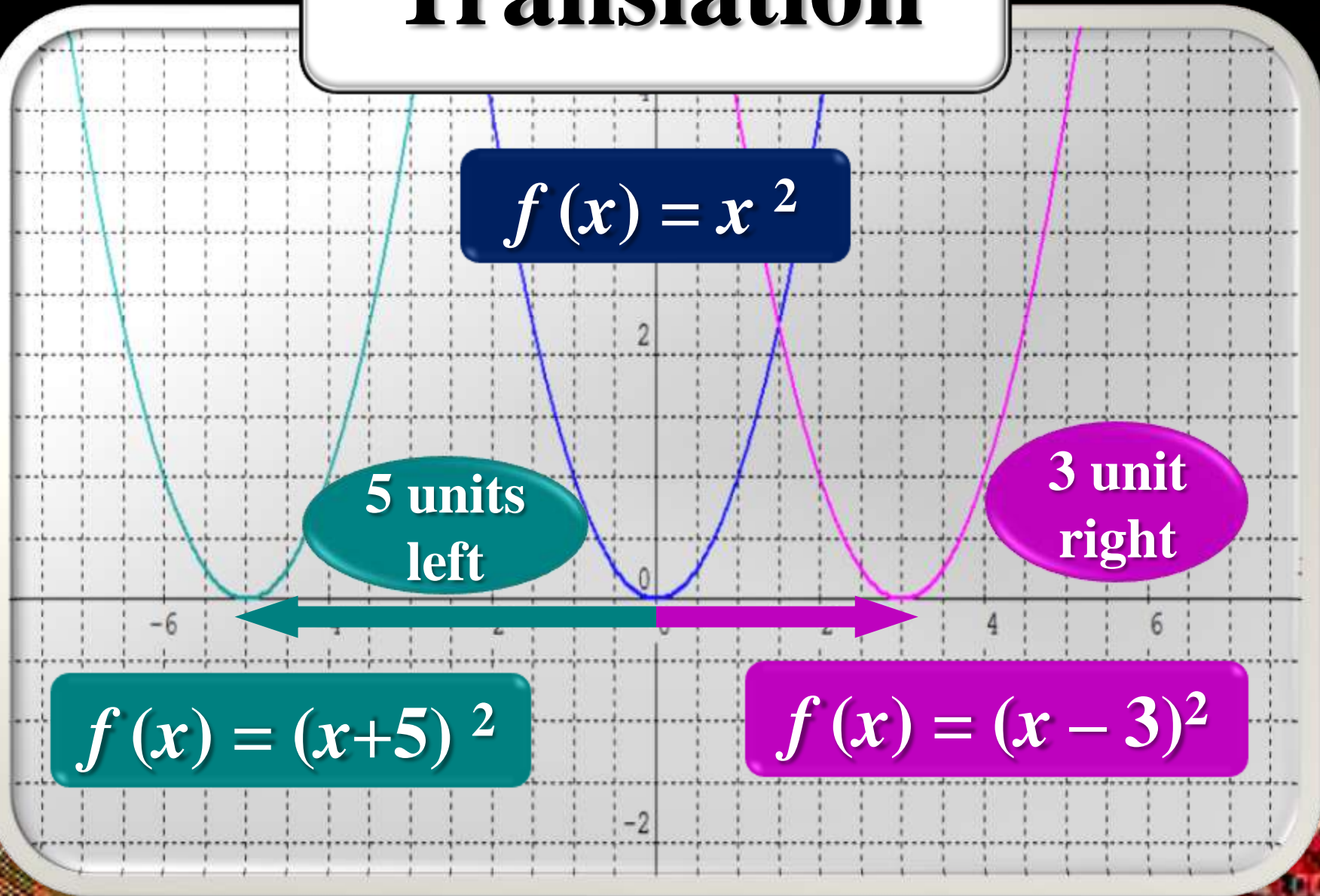
$$f(x) = x^2$$

5 units  
left

3 unit  
right

$$f(x) = (x+5)^2$$

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



# Reflection

$$-f(x)$$

**Reflects  
graph in  
the  
 $x$ -axis**

$$f(-x)$$

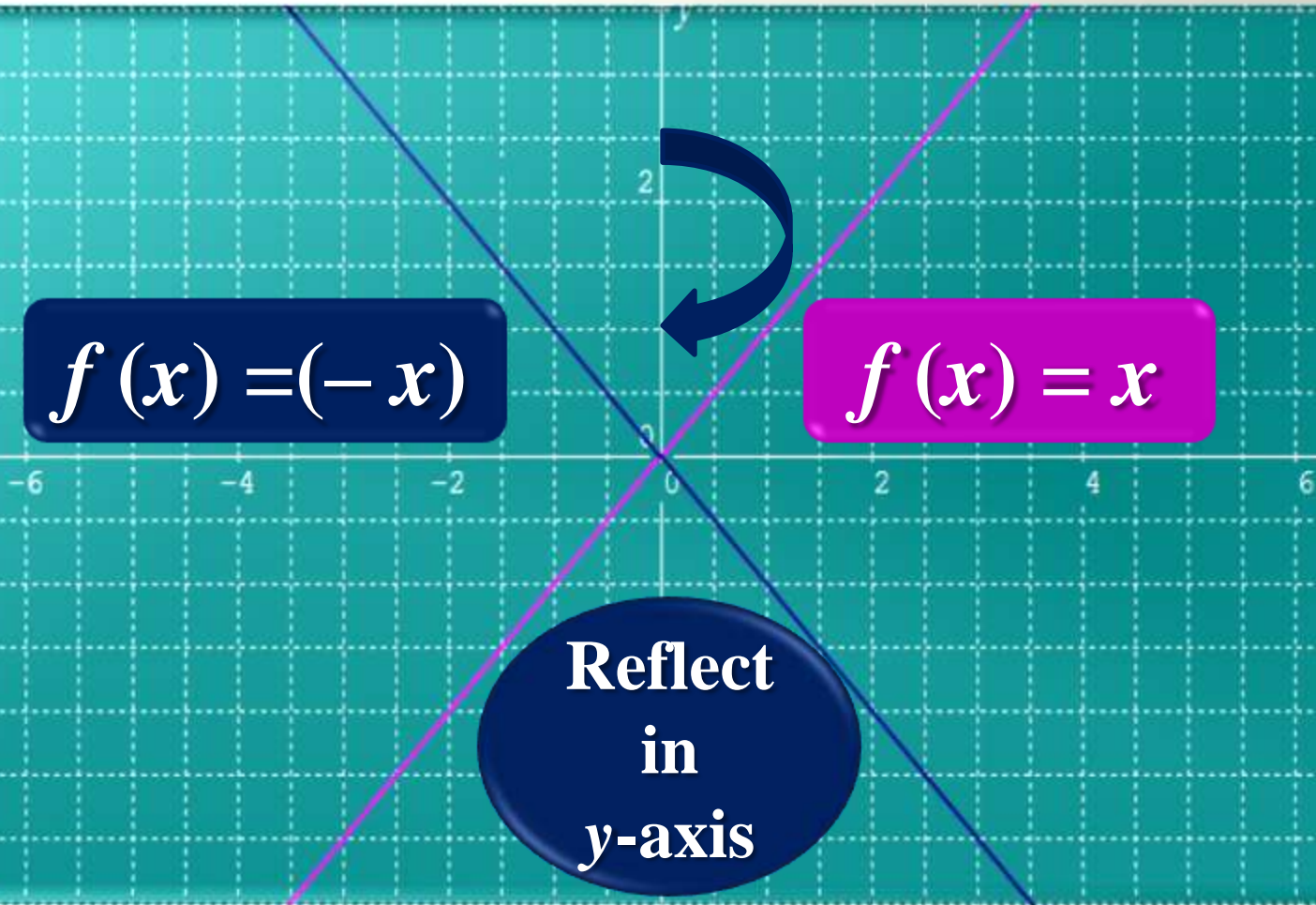
**Reflects  
graph in  
the  
 $y$ -axis**

# Reflection

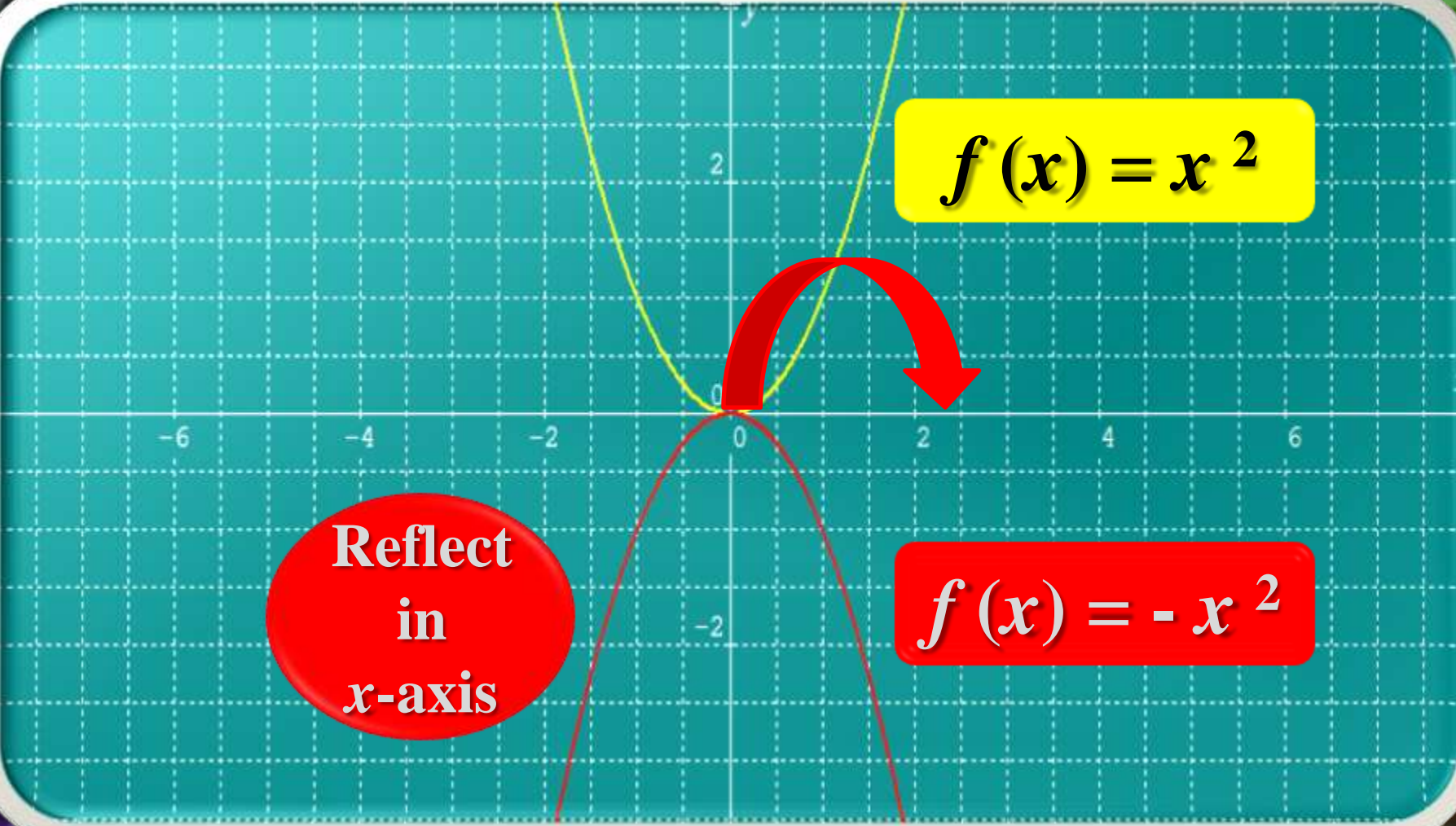
$$f(x) = (-x)$$

$$f(x) = x$$

Reflect  
in  
y-axis



# Reflection



A coordinate plane with a grid. The x-axis is labeled from -6 to 6, and the y-axis is labeled from -2 to 2. A yellow parabola opens upwards with its vertex at the origin (0,0). A red parabola opens downwards with its vertex at the origin (0,0). A red curved arrow points from the yellow parabola to the red parabola, indicating a reflection across the x-axis.

$$f(x) = x^2$$

Reflect  
in  
x-axis

$$f(x) = -x^2$$



# Dilation

**Vertical**

**Horizontal**

$$a \cdot f(x)$$

$$f(b \cdot x)$$

$$a > 1$$

**Stretching**

$$0 < b < 1$$

**Compression**

$$0 < a < 1$$

$$b > 1$$

# Dilation

$$f(x) = 3x^2$$

Vertical stretch

$$f(x) = x^2$$

$$f(x) = \frac{1}{4}x^2$$

Vertical Compression

-6

-4

-2

0

2

# Dilation

$$f(x) = |2x|$$

Horizontal  
Compression

Vertical  
Stretching

$$f(x) = |1/3 x|$$

$$f(x) = |x|$$

