



# 2.7

## *Parent Functions and Transformations*

# Parent Functions

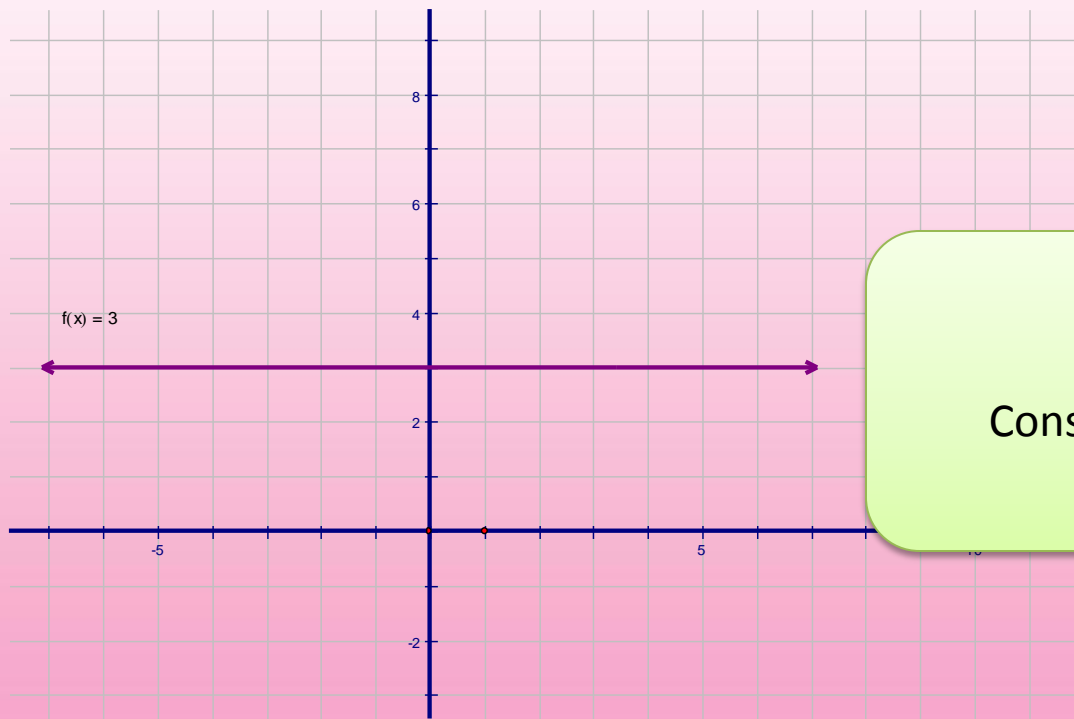
$$f(x) = x \quad \text{-----} \quad y = x \quad (\text{Identity function})$$

$$f(x) = 3 \text{ ( any number) } \text{.....( constant function )}$$

$$f(x) = |x| \text{-----} \quad y = |x| \quad (\text{Absolute value function})$$

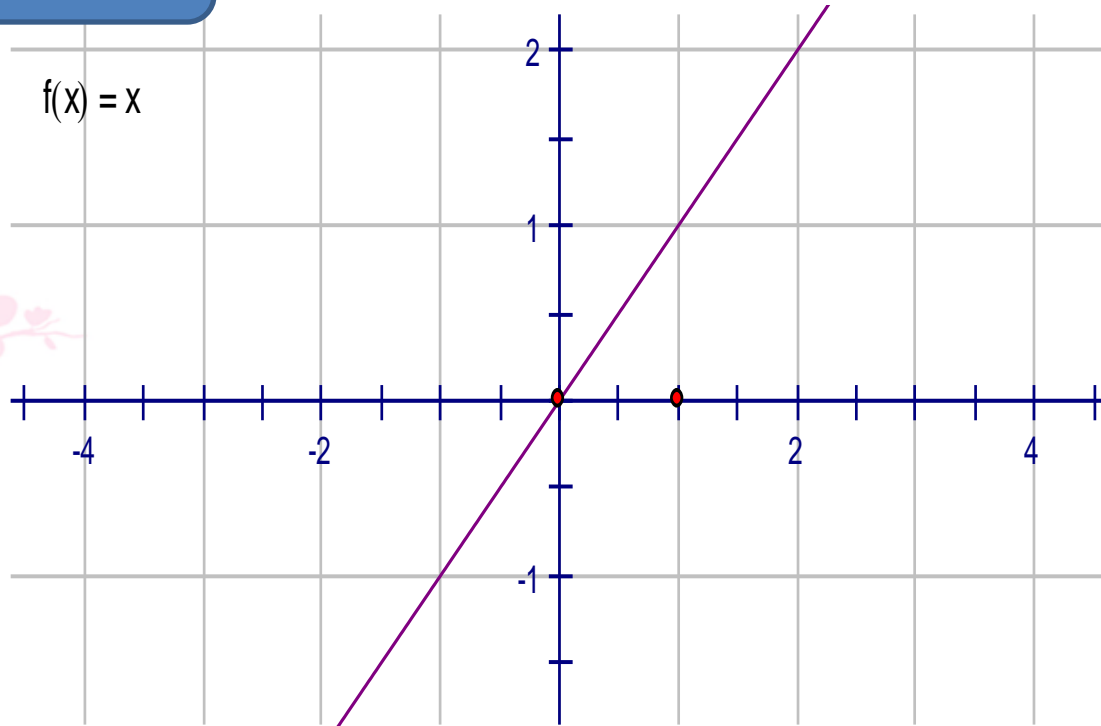
$$f(x) = x^2 \quad \text{-----} \quad y = x^2 \quad (\text{Quadratic function})$$

# *Graphs of the parent functions*



$F(x) = 3$   
Constant function

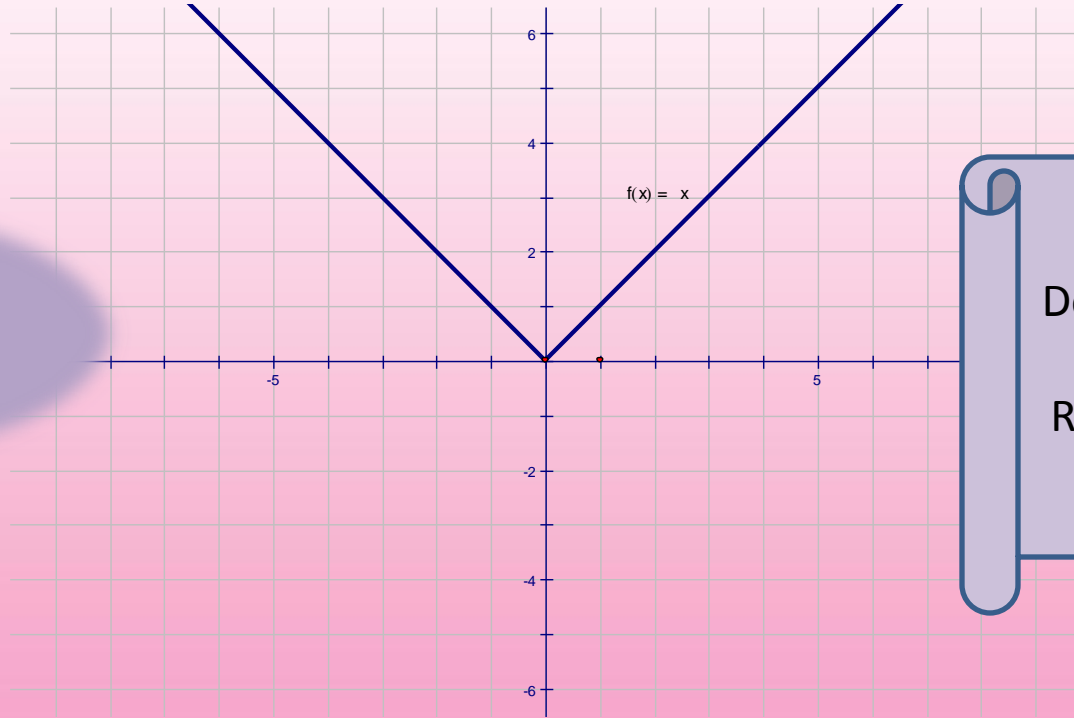
Domain :  $\mathbb{R}$   
Range :  $\mathbb{R}$



$F(x) = x$   
Identity  
function  
(Linear)

# Absolute value function

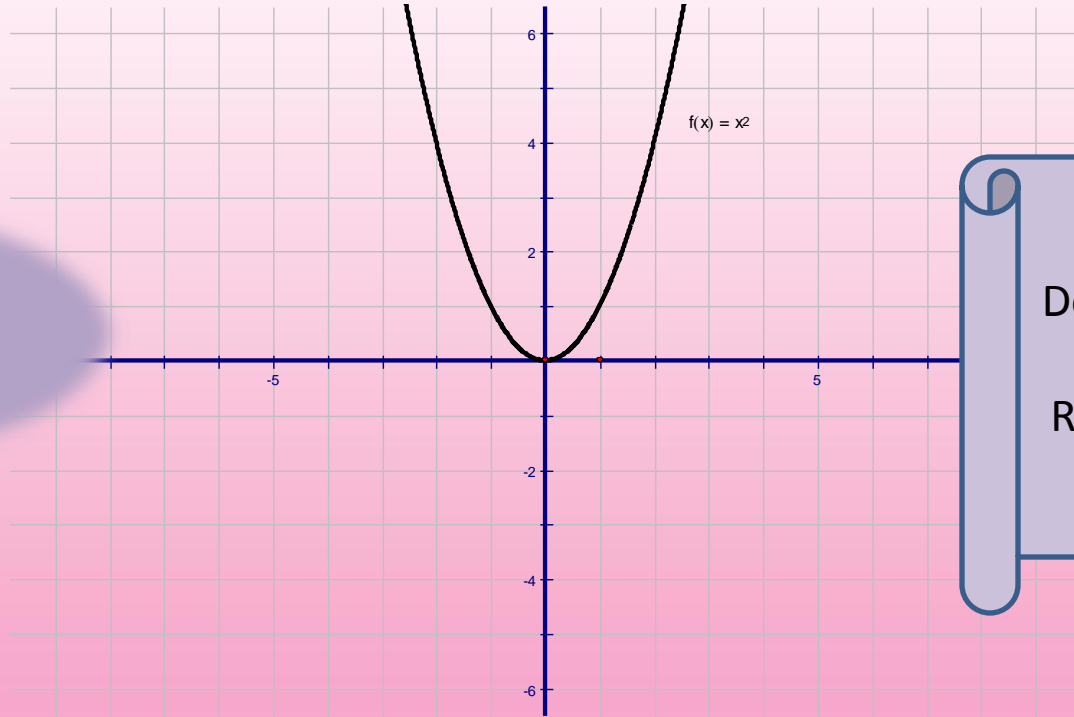
$f(x) = |x|$   
V shape  
function



Domain : all real numbers  
Range :  $(y:y \geq 0)$

# Quadratic function..... $f(x) = x^2$

$f(x) = x^2$   
U shape  
function



Domain : all real numbers  
Range :  $(y: y \geq 0)$

# *Trasformations*

$$f(x) = a(bx \pm h) \pm k$$

$$f(x) = a | bx \pm h | \pm k$$

$$f(x) = a(bx \pm h)^2 \pm k$$

**a****b****h****k**

$$a > 1$$

The graph stretches vertically

$$0 < b < 1$$

The graph compresses horizontally

$$+h$$

h units to the left

$$+k$$

h units up

$$0 < a < 1$$

The graph compresses vertically

$$b > 1$$

The graph stretches horizontally

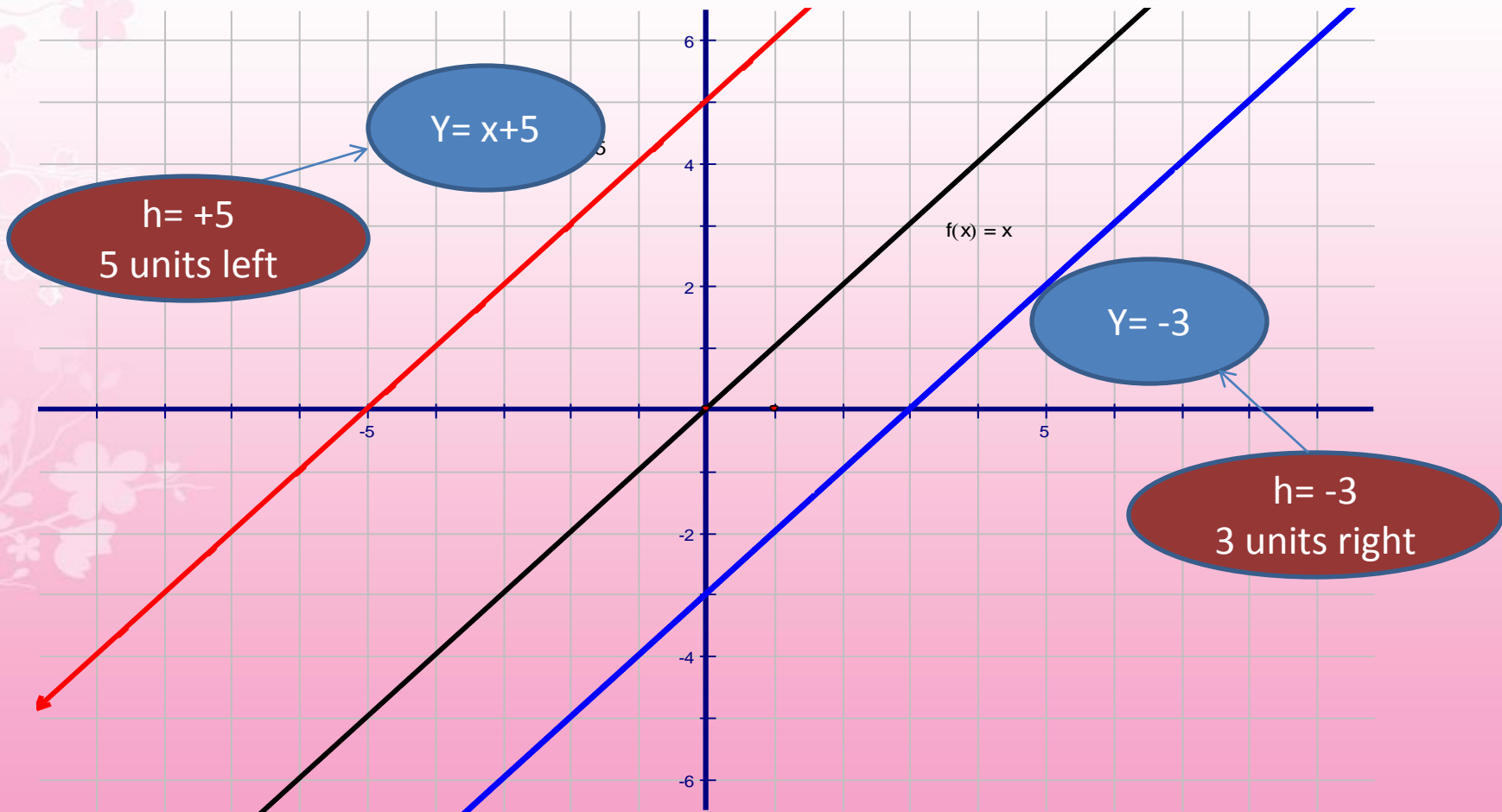
$$-h$$

h units to the right

$$-k$$

h units down





$\pm h$

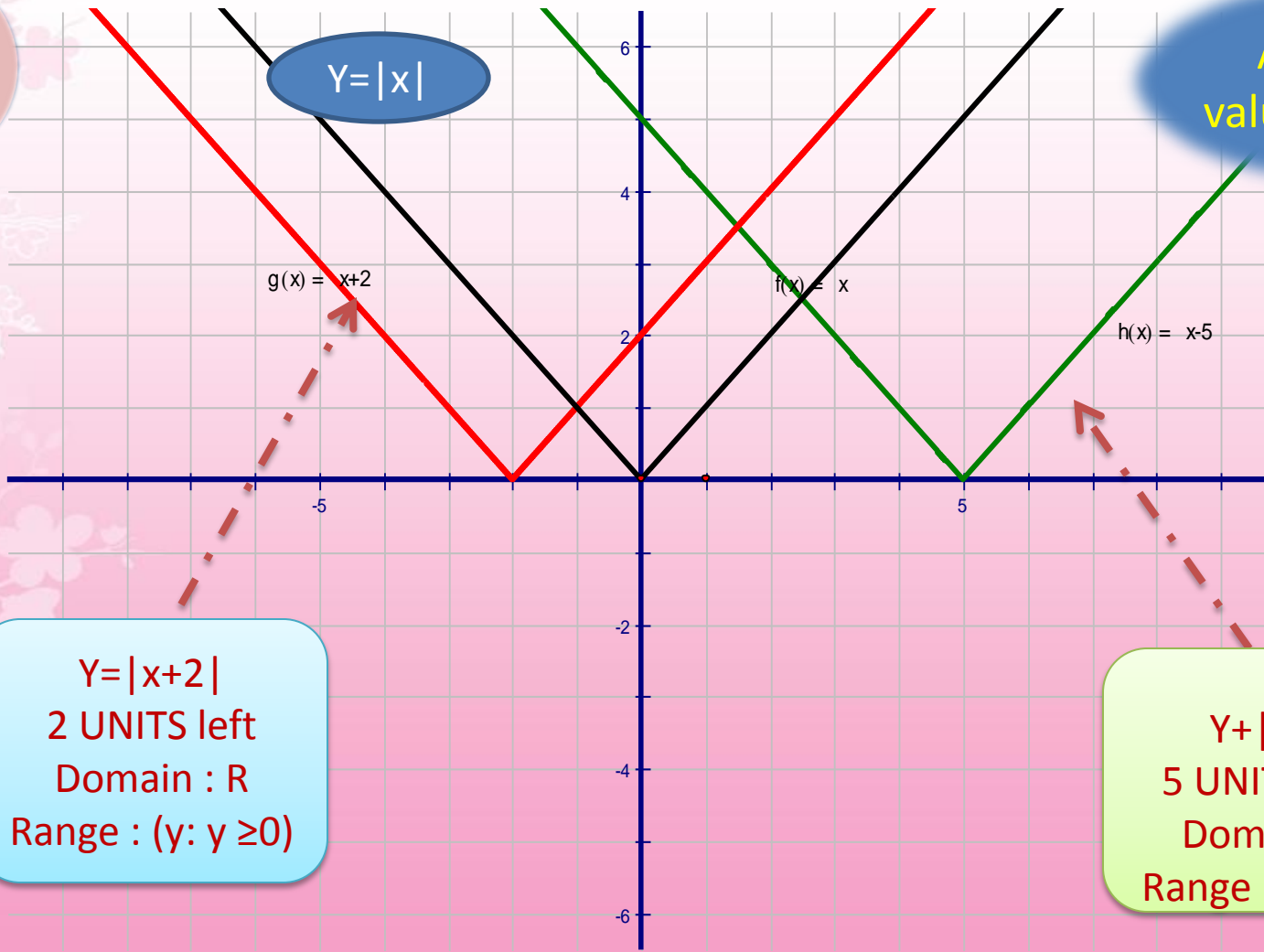
$Y = |x|$

Absolute value function

$g(x) = |x+2|$

$f(x) = x$

$h(x) = |x-5|$



$Y = |x+2|$   
2 UNITS left  
Domain : R  
Range : (y: y ≥ 0)

$Y + |x-5|$   
5 UNITS right  
Domain : R  
Range : (y: y ≥ 0)

$\pm k$

Absolute value function

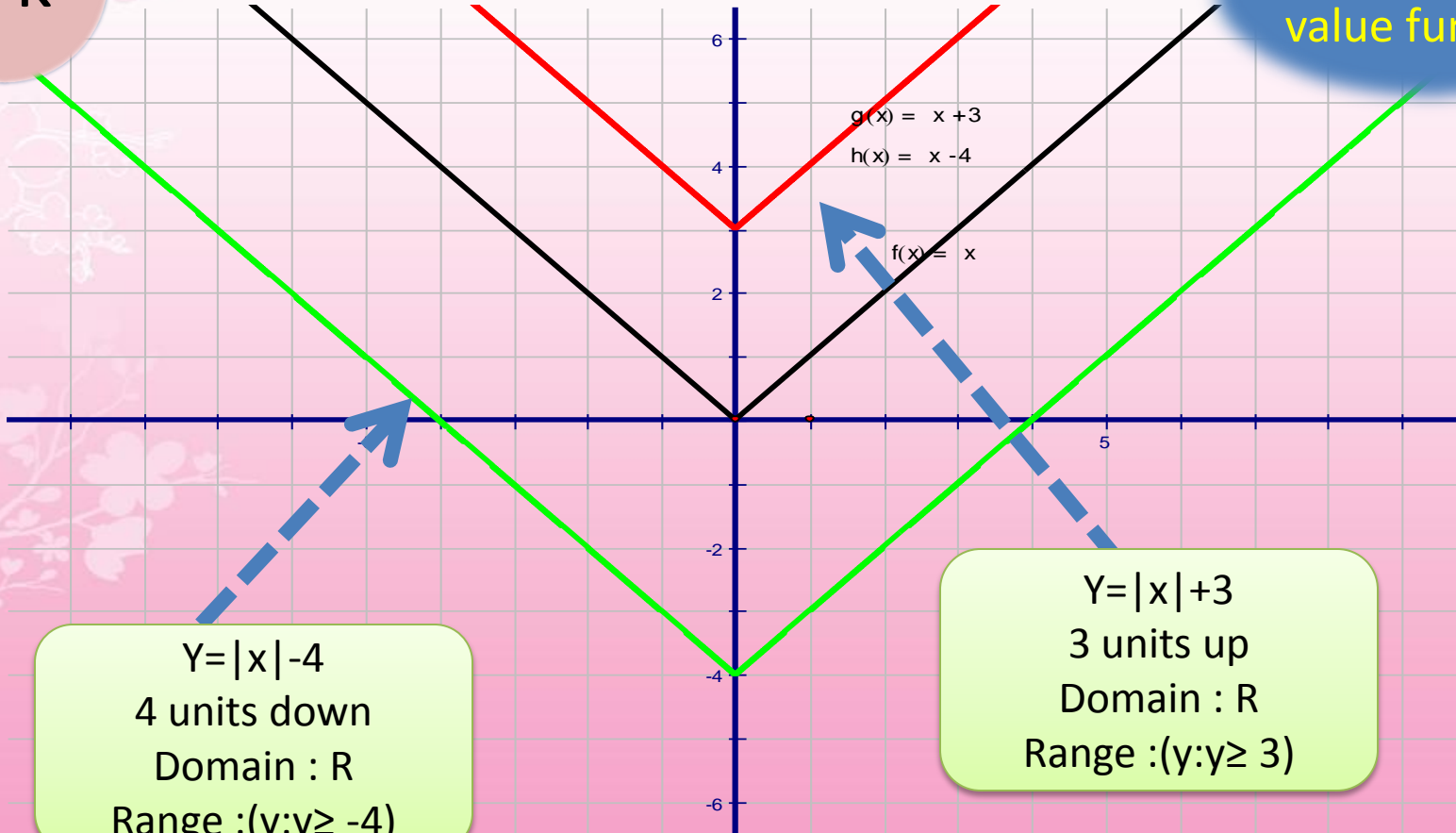
$g(x) = x + 3$

$h(x) = x - 4$

$f(x) = x$

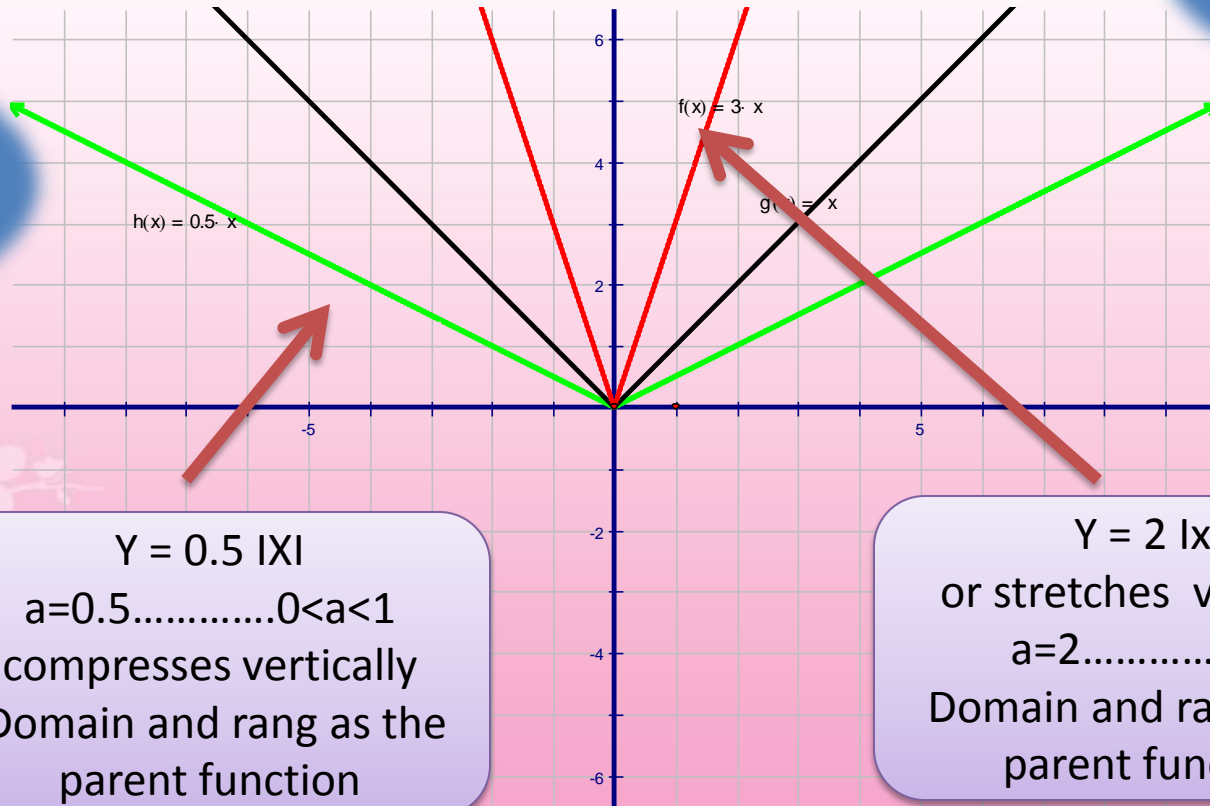
$Y = |x| - 4$   
4 units down  
Domain :  $\mathbb{R}$   
Range :  $(y: y \geq -4)$

$Y = |x| + 3$   
3 units up  
Domain :  $\mathbb{R}$   
Range :  $(y: y \geq 3)$



# Absolute value function

a



$Y = 0.5 |x|$   
 $a=0.5 \dots \dots \dots 0 < a < 1$   
compresses vertically  
Domain and rang as the  
parent function

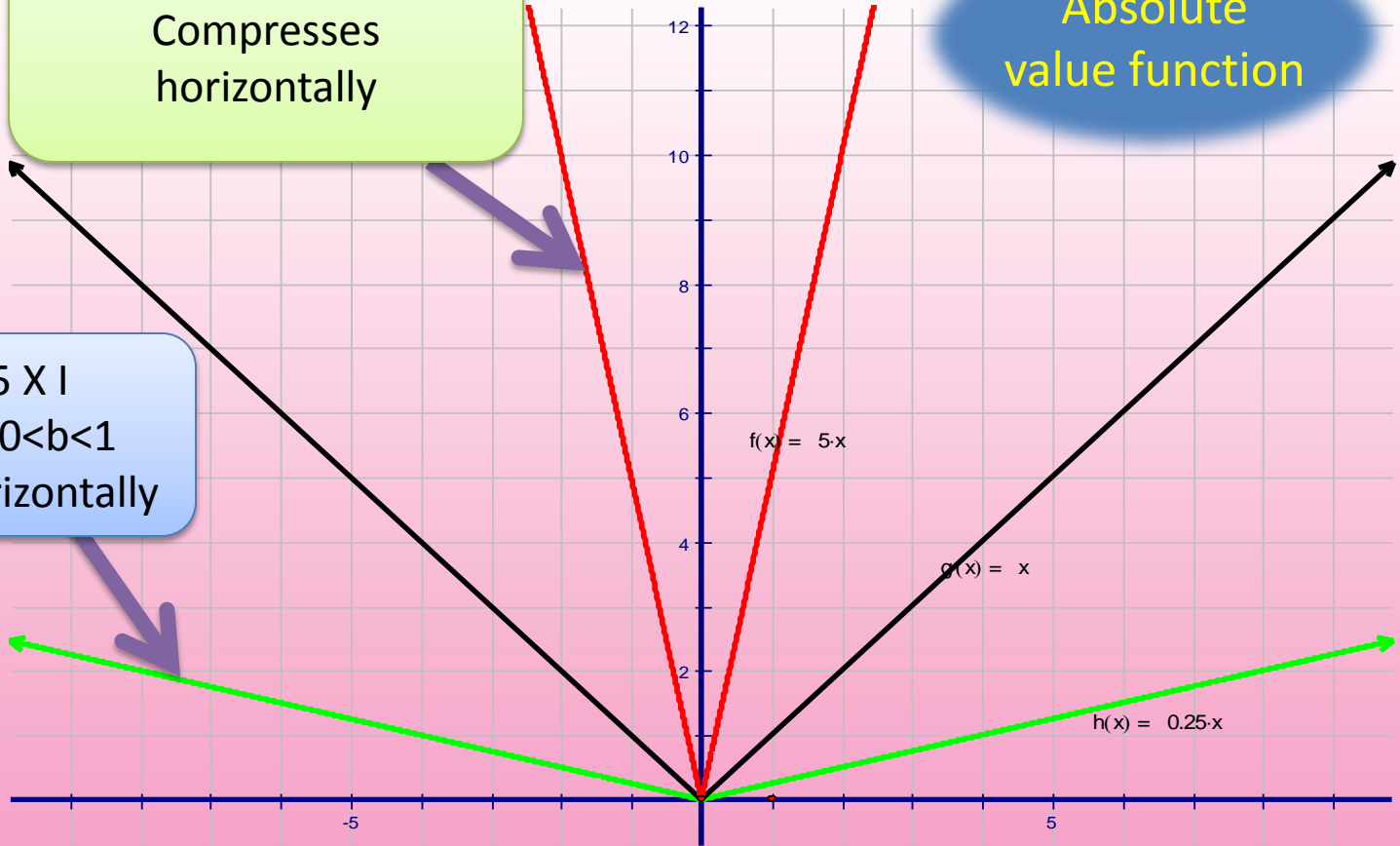
$Y = 2 |x|$   
or stretches vertically  
 $a=2 \dots \dots \dots a > 1$   
Domain and rang as the  
parent function

**b**

$Y = |5x|$   
 $b=5 \dots\dots b>1$   
Compresses  
horizontally

$Y = |0.25x|$   
 $b=0.25 \dots\dots 0<b<1$   
Stretches horizontally

Absolute  
value function



$\pm h$

Quadratic function

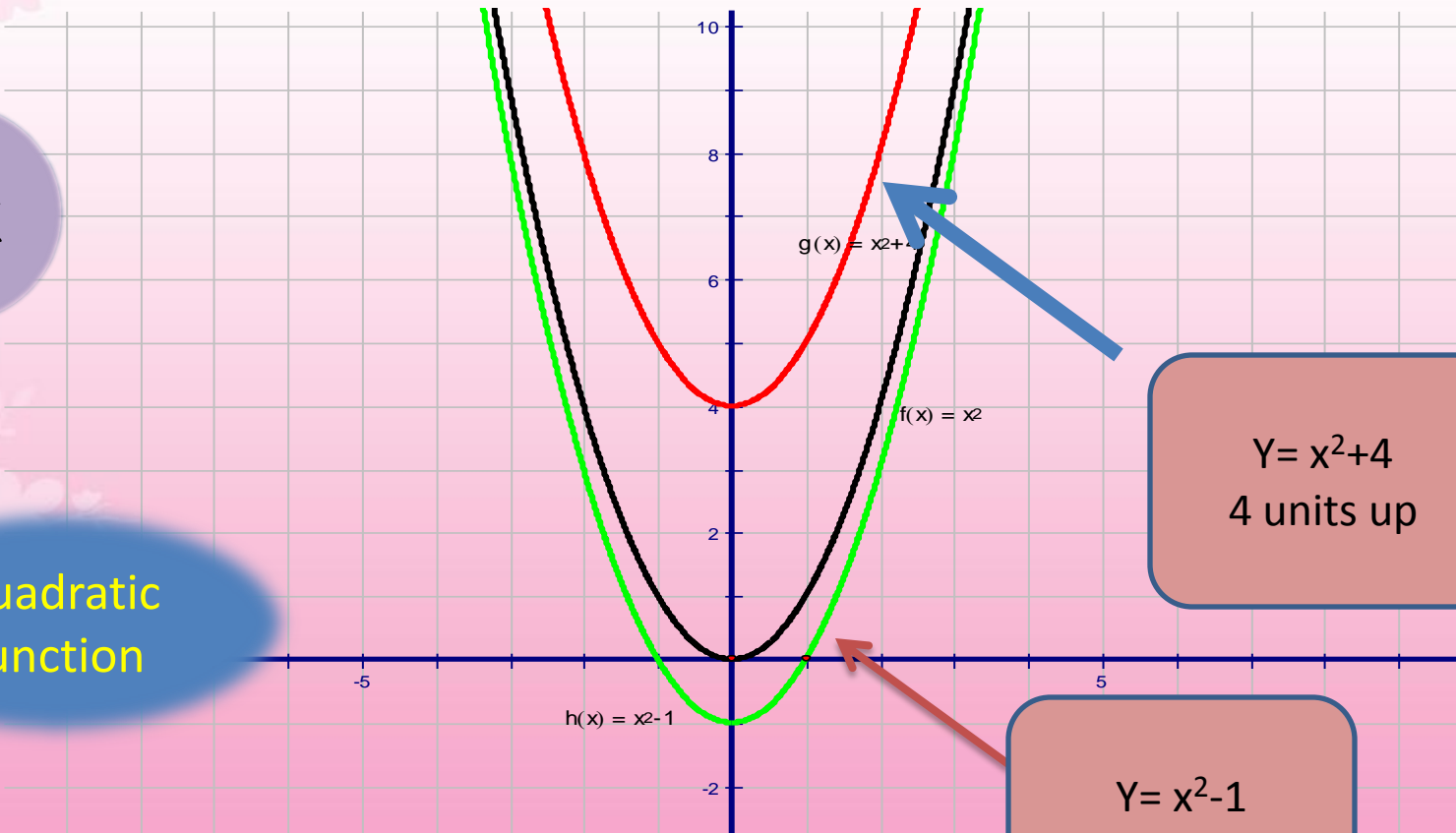
$Y = (x+3)^2$   
3 units left



$Y = (x-5)^2$   
5 units

$\pm k$

Quadratic  
function

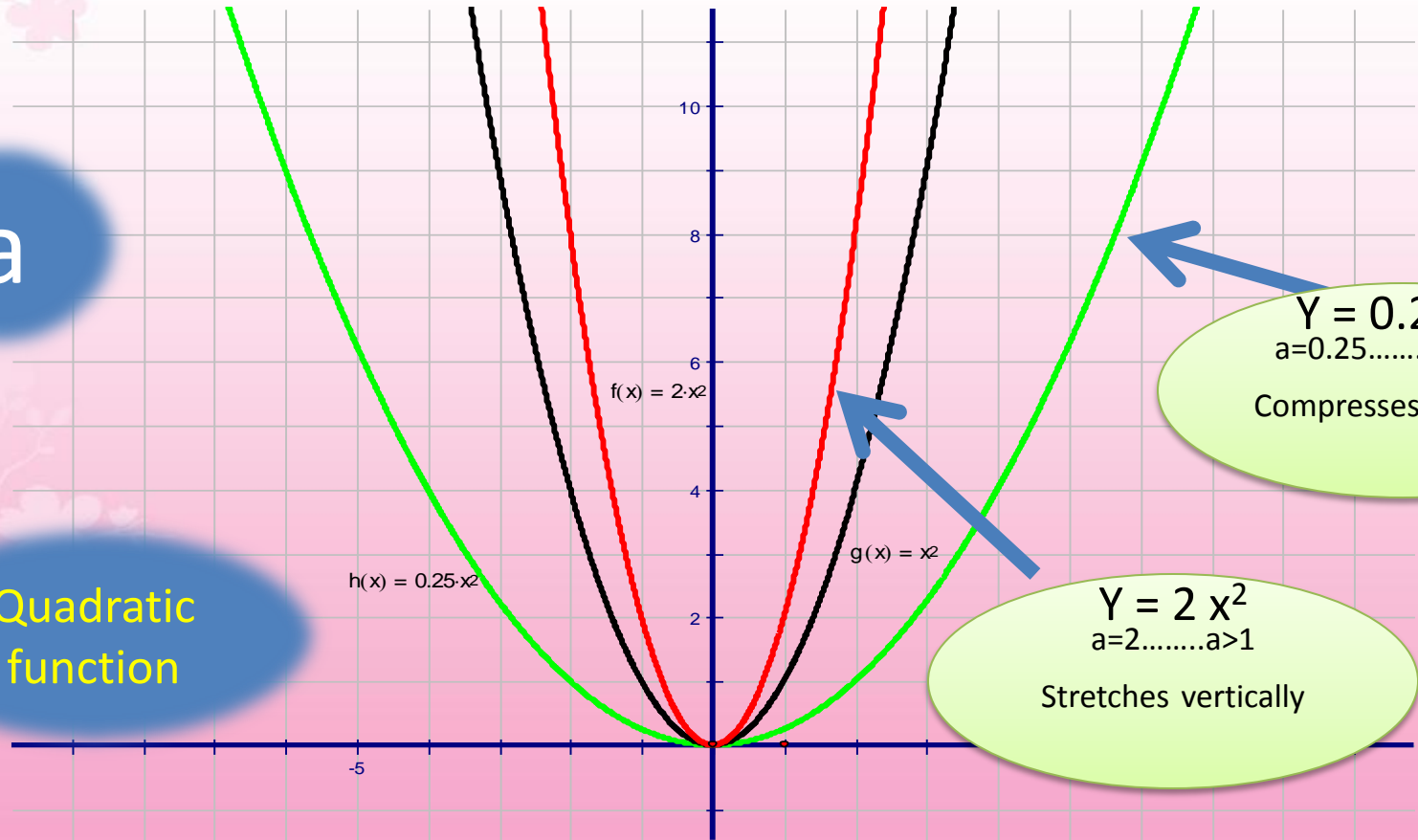


$Y = x^2 + 4$   
4 units up

$Y = x^2 - 1$   
1 unit down

a

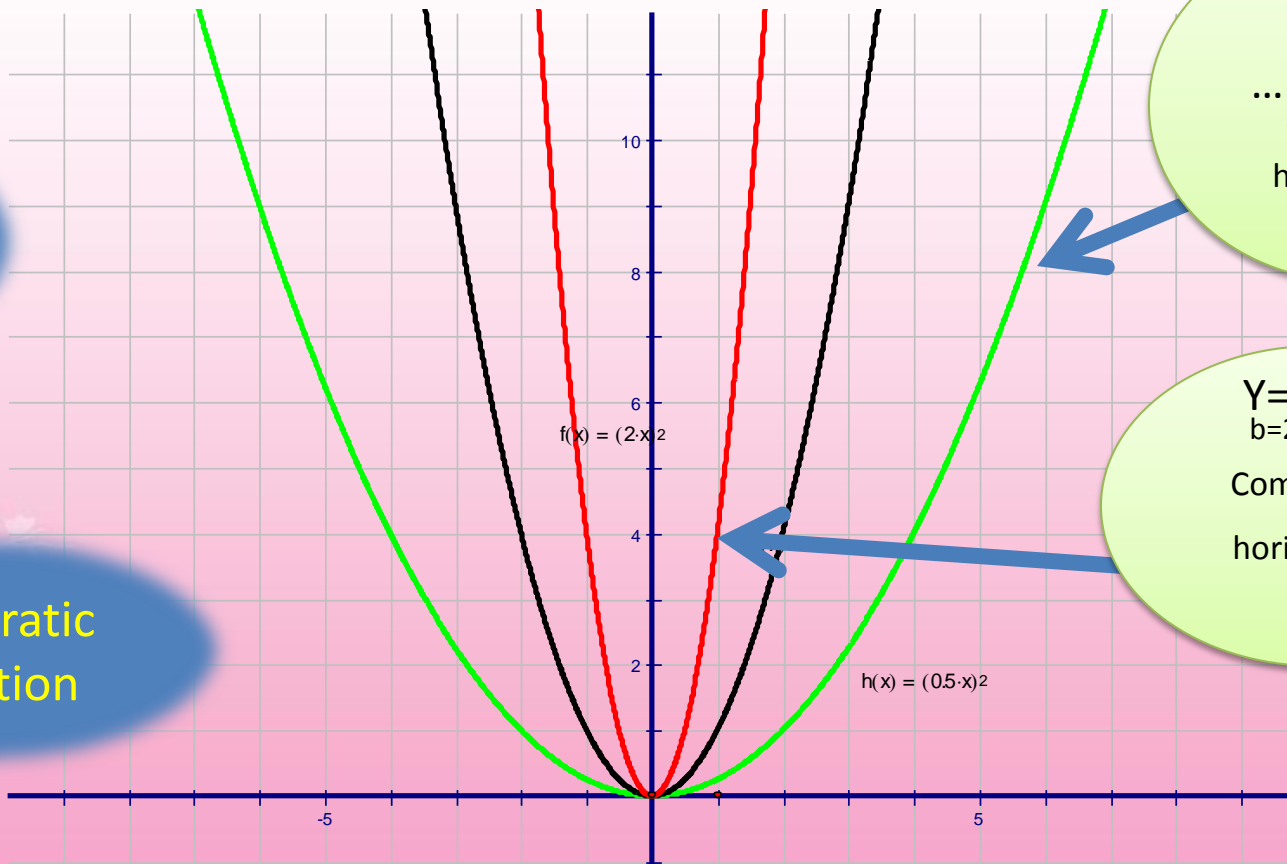
Quadratic  
function





**b**

Quadratic  
function



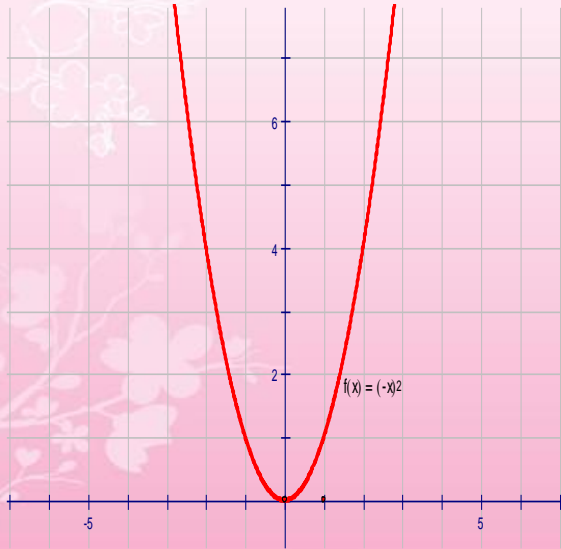
$Y = (0.5 x)^2$   
 $b = 0.5$

..... $0 < b < 1$   
'Stretches'  
horizontally

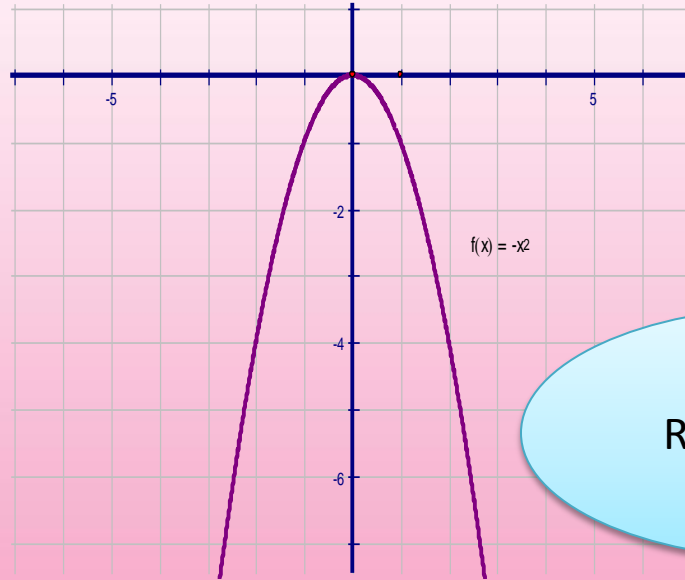
$Y = (2 x)^2$   
 $b = 2 \dots b > 1$

Compresses  
horizontally

# Reflection

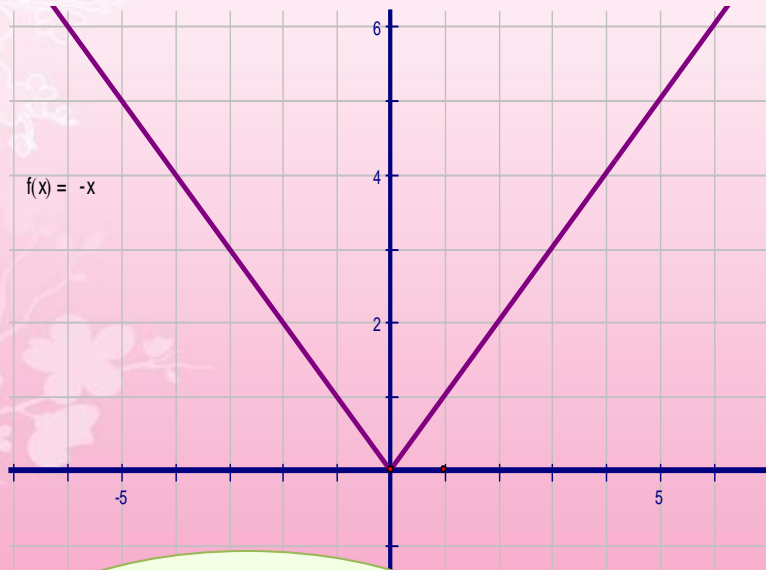


$F(x) = (-x)^2$   
Reflect about  
Y - axis



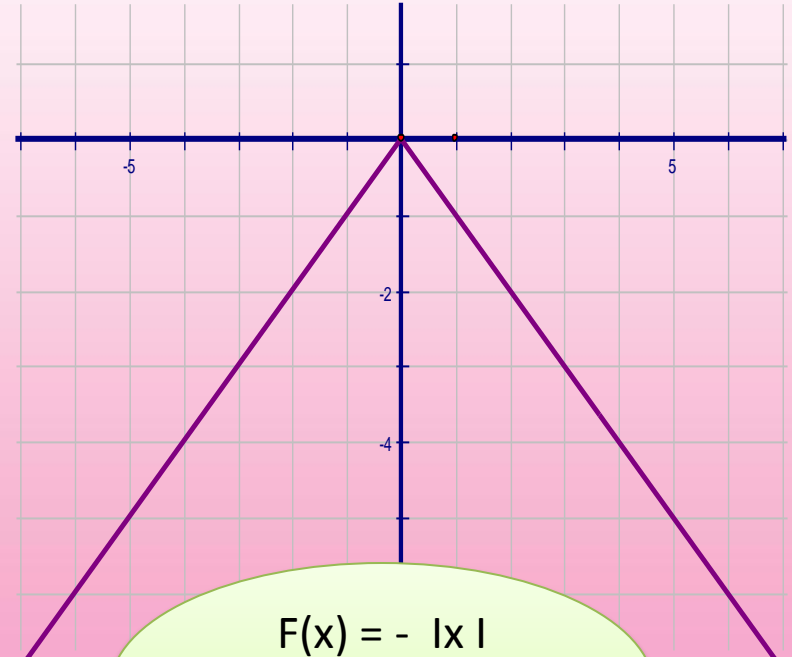
$F(x) = -(x^2)$   
Reflect about  
x - axis

# Reflection



$$f(x) = -x$$

$F(x) = |x|$   
Reflect about  
Y - axis



$F(x) = -|x|$   
Reflect about  
X - axis

# Required Exercises

Text book page 113- 116

# 1-4,5,6,8,10-13,14,15,18,19,21,22,28,29,44,51

Thank you