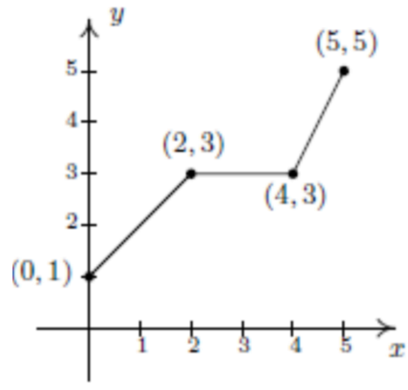
Transformations : الازاحات (1

أ) الازاحات الرئسية :

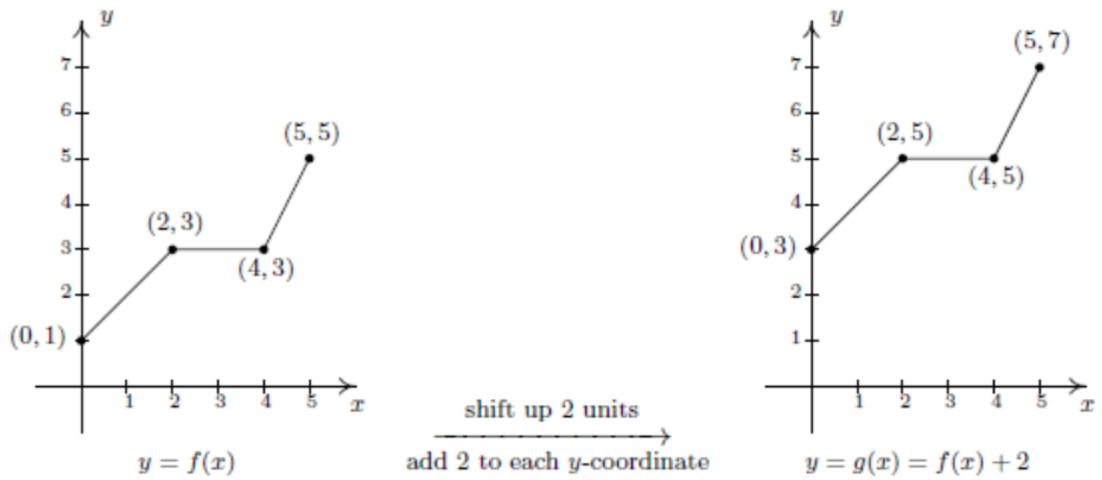
Theorem 1.2. Vertical Shifts. Suppose f is a function and k is a positive number.

- To graph $y = f(x) + k$, shift the graph of $y = f(x)$ up k units by adding k to the y-coordinates of the points on the graph of f.
- To graph $y = f(x) - k$, shift the graph of $y = f(x)$ down k units by subtracting k from the y-coordinates of the points on the graph of f.

$f:(x,y)$	$g(x) = f(x) + 2$		$g(x):(x,y)$
$(0,1)$	$x = 0$	$y = 1 + 2 = 3$	
$(2,3)$	$x = 2$	$y = 3 + 2 = 5$	
$(4,3)$	$x = 4$	$y = 3 +$	
$(5,5)$	$x = 5$	$y = 5 +$	



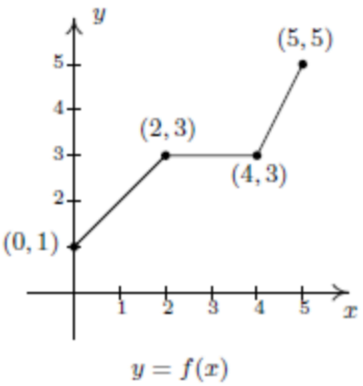
$y = f(x)$



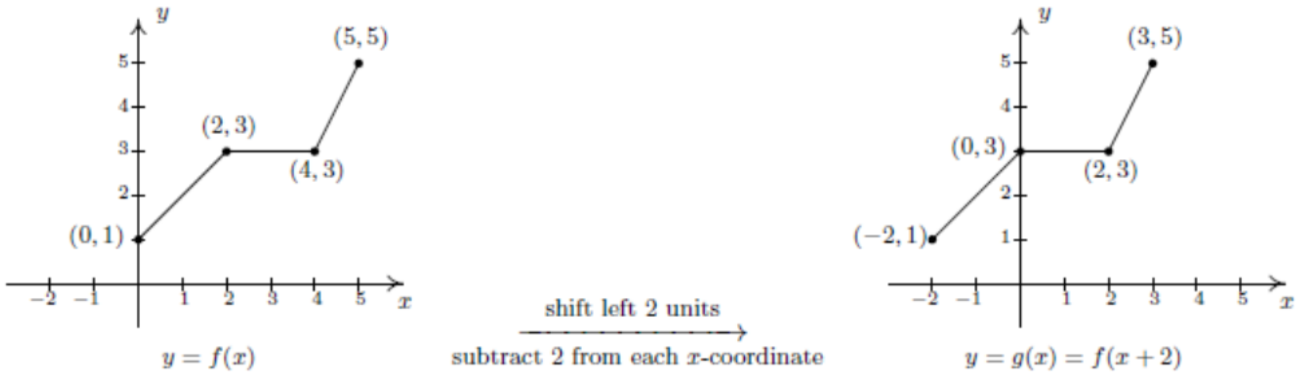
ب) <u>الازاحات الأفقية :</u>

Theorem 1.3. Horizontal Shifts. Suppose f is a function and h is a positive number.

- To graph $y = f(x+h)$, shift the graph of $y = f(x)$ left h units by subtracting h from the x-coordinates of the points on the graph of f.
- To graph $y = f(x-h)$, shift the graph of $y = f(x)$ right h units by adding h to the x-coordinates of the points on the graph of f.



$f:(x,y)$	$g(x) = f(x+2)$		$g(x):(x,y)$
(0,1)	$x = 0 - 2 = -2$	$y = 1$	
(2,3)	$x = 2 - 2 =$	$y = 3$	
(4,3)	$x = 4 - 2$	$y = 3$	
(5,5)	$x = 5 -$	$y = 5$	



ج) $g(x) = f(x-1) - 2$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = \sqrt{x} - 1$
2) $N(x) = \sqrt{x-1}$
3) $S(x) = \sqrt{x+3} - 2$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = \sqrt{x} - 1$
2) $N(x) = \sqrt{x-1}$
3) $S(x) = \sqrt{x+3} - 2$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = \sqrt{x} - 1$
2) $N(x) = \sqrt{x-1}$
3) $S(x) = \sqrt{x+3} - 2$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = \sqrt{x} - 1$
2) $N(x) = \sqrt{x-1}$
3) $S(x) = \sqrt{x+3} - 2$

مثال (مجموعات):

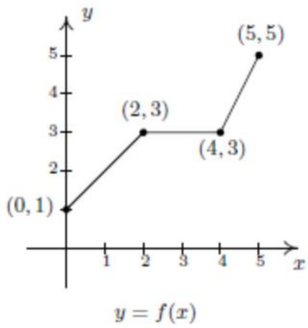
استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = \sqrt{x} - 1$
2) $N(x) = \sqrt{x-1}$
3) $S(x) = \sqrt{x+3} - 2$

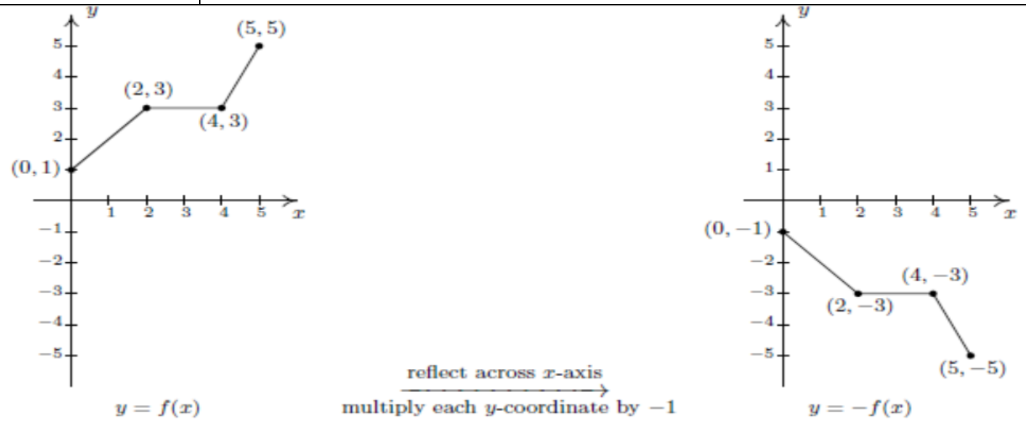
2) الانعكاسات: Reections

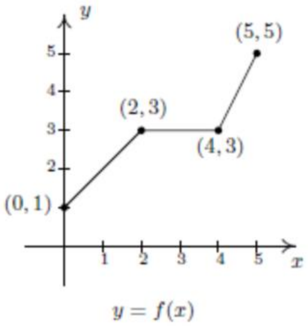
Theorem 1.4. Reflections. Suppose f is a function.

- To graph $y = -f(x)$, reflect the graph of $y = f(x)$ across the x-axis by multiplying the y-coordinates of the points on the graph of f by -1.
- To graph $y = f(-x)$, reflect the graph of $y = f(x)$ across the y-axis by multiplying the x-coordinates of the points on the graph of f by -1.

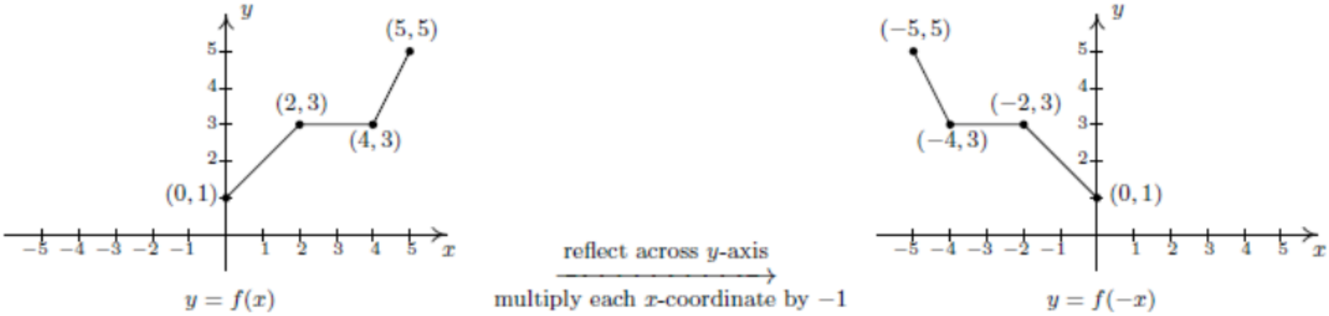


$f:(x,y)$	$g(x) = -f(x)$		$g(x):(x,y)$
(0,1)	$x = 0$	$y = -1 \times 1 = -1$	
(2,3)	$x = 2$	$y = -1 \times 3 = -3$	
(4,3)	$x = 4$	$y = -1 \times$	
(5,5)	$x = 5$	$y = -1 \times$	





$f:(x,y)$	$g(x) = f(-x)$		$g(x):(x,y)$
(0,1)	$x = -1 \times 0 = 0$	$y = 1$	
(2,3)	$x = -1 \times 2 = -2$	$y = 3$	
(4,3)	$x = -1 \times 4 =$	$y = 3$	
(5,5)	$x = -1 \times 5$	$y = 5$	



مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = \sqrt{-x}$
2) $N(x) = \sqrt{3-x}$
3) $S(x) = 3 - \sqrt{x}$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = \sqrt{-x}$
2) $N(x) = \sqrt{3-x}$
3) $S(x) = 3 - \sqrt{x}$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = \sqrt{-x}$
2) $N(x) = \sqrt{3-x}$
3) $S(x) = 3 - \sqrt{x}$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = \sqrt{-x}$
2) $N(x) = \sqrt{3-x}$
3) $S(x) = 3 - \sqrt{x}$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

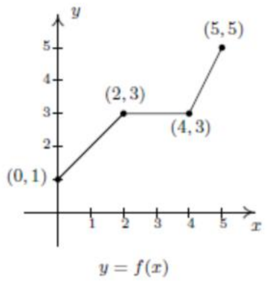
1) $g(x) = \sqrt{-x}$
2) $N(x) = \sqrt{3-x}$
3) $S(x) = 3 - \sqrt{x}$

3) التمدد والانكماش(الإنضغاط):

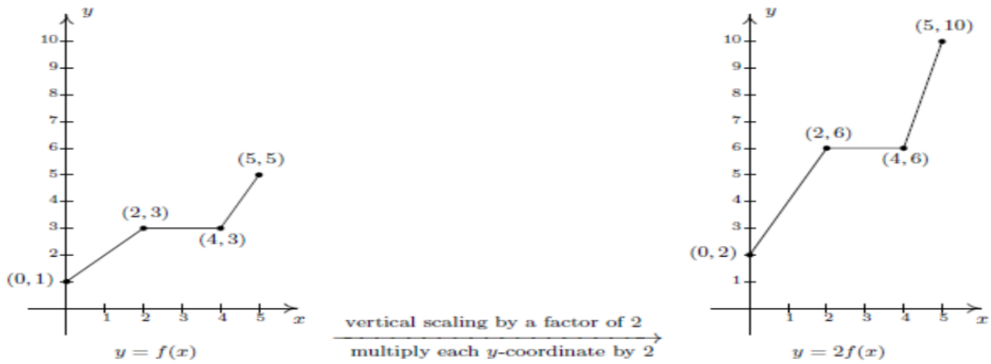
أ) الرأسي :

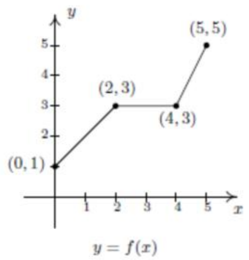
Theorem 1.5. Vertical Scalings. Suppose f is a function and $a > 0$. To graph $y = af(x)$, multiply all of the y-coordinates of the points on the graph of f by a. We say the graph of f has been vertically scaled by a factor of a.

- If $a > 1$, we say the graph of f has undergone a vertical stretching (expansion, dilation) by a factor of a.
- If $0 < a < 1$, we say the graph of f has undergone a vertical shrinking (compression, contraction) by a factor of $\frac{1}{a}$.

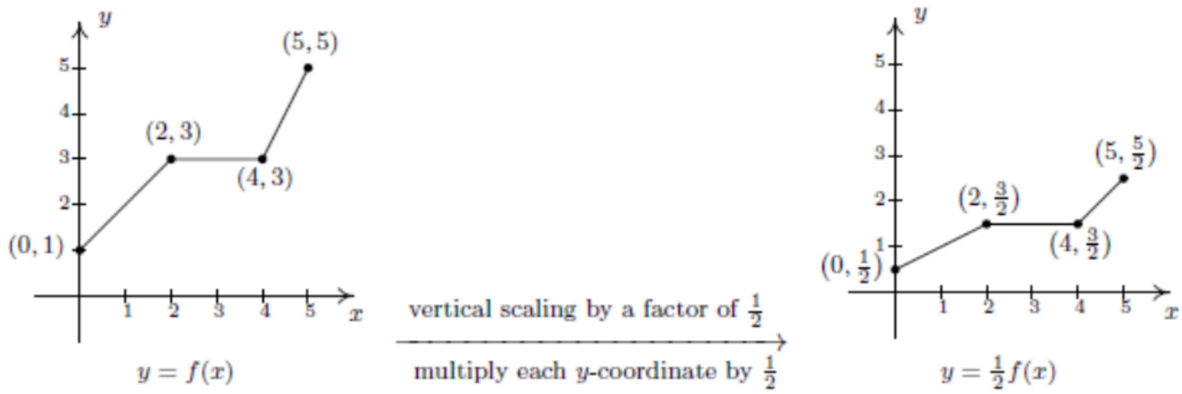


$f:(x,y)$	$g(x) = 2f(x)$		$g(x):(x,y)$
(0,1)	$x = 0$	$y = 2 \times 1 = 2$	
(2,3)	$x = 2$	$y = 2 \times 3 = 6$	
(4,3)	$x = 4$	$y = 2 \times$	
(5,5)	$x = 5$	$y = 2 \times$	





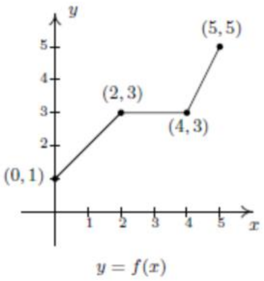
$f:(x,y)$	$g(x) = 0.5f(x)$		$g(x):(x,y)$
(0,1)	$x = 0$	$y = 0.5 \times 1 = 0.5$	
(2,3)	$x = 2$	$y = 0.5 \times 3 = 1.5$	
(4,3)	$x = 4$	$y = 0.5 \times$	
(5,5)	$x = 5$	$y = 0.5 \times$	



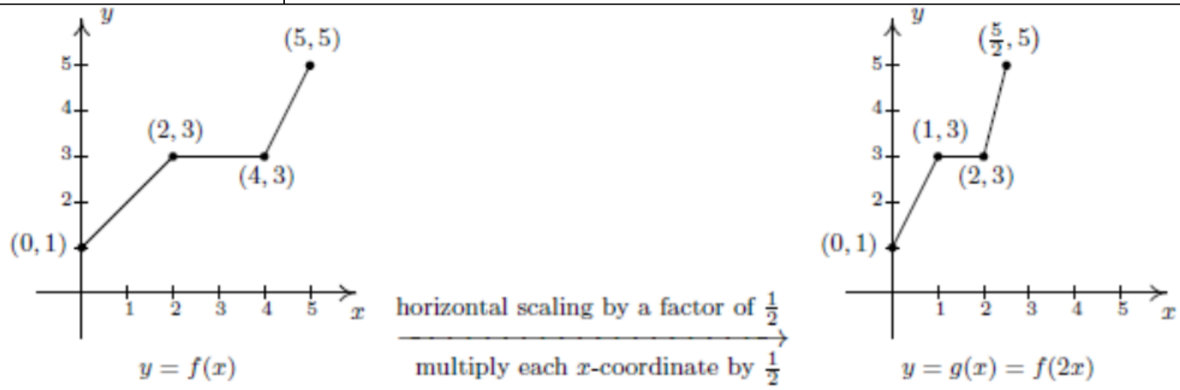
أ) **الأفقي :**

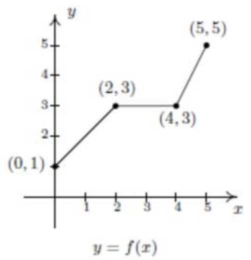
Theorem 1.6. Horizontal Scalings. Suppose f is a function and $b > 0$. To graph $y = f(bx)$, divide all of the x-coordinates of the points on the graph of f by b. We say the graph of f has been horizontally scaled by a factor of $\frac{1}{b}$.

- If $0 < b < 1$, we say the graph of f has undergone a horizontal stretching (expansion, dilation) by a factor of $\frac{1}{b}$.
- If $b > 1$, we say the graph of f has undergone a horizontal shrinking (compression, contraction) by a factor of b.

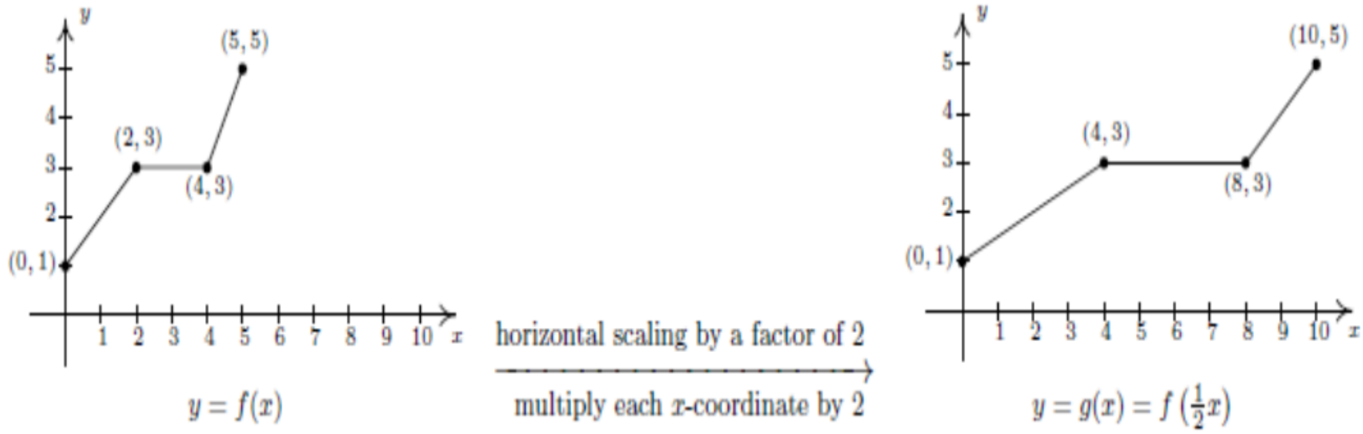


$f:(x,y)$	$g(x) = f(2x)$		$g(x):(x,y)$
(0,1)	$x = 0.5 \times 0 = 0$	$y = 1$	
(2,3)	$x = 0.5 \times 2 = 1$	$y = 3$	
(4,3)	$x = 0.5 \times 4 =$	$y = 3$	
(5,5)	$x = 0.5 \times 5 =$	$y = 5$	





$f:(x,y)$	$g(x) = f(0.5x)$		$g(x):(x,y)$
(0,1)	$x = 2 \times 0 = 0$	$y = 1$	
(2,3)	$x = 2 \times 2 = 4$	$y = 3$	
(4,3)	$x = 2 \times 4 =$	$y = 3$	
(5,5)	$x = 2 \times 5 =$	$y = 5$	



مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = 3\sqrt{x}$
2) $N(x) = \sqrt{9x}$
3) $S(x) = 1 - \sqrt{\frac{x+3}{2}}$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = 3\sqrt{x}$
2) $N(x) = \sqrt{9x}$
3) $S(x) = 1 - \sqrt{\frac{x+3}{2}}$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = 3\sqrt{x}$
2) $N(x) = \sqrt{9x}$
3) $S(x) = 1 - \sqrt{\frac{x+3}{2}}$

مثال (مجموعات):

استخدم الرسم البياني للدالة $f(x) = \sqrt{x}$ لرسم كل دالة أتية:

1) $g(x) = 3\sqrt{x}$
2) $N(x) = \sqrt{9x}$
3) $S(x) = 1 - \sqrt{\frac{x+3}{2}}$