

  horizontal translation Right 6 h	vertical translation Up 8 k	horizontal translation left 4 and vertical translation down 7
$y=f(x)$ $y=f(x-6)$	$y=f(x)+8$	$y=f(x+4)-7$
$y=x^2$ $y=(x-6)^2$	$y=x^2+8$	$y=(x+4)^2-7$
$y=x^3$ $y=(x-6)^3$	$y=x^3+8$	$y=(x+4)^3-7$
$y= x $ $y= x-6 $	$y= x +8$	$y= x+4 -7$
$y=\sqrt{x}$ $y=\sqrt{x-6}$	$y=\sqrt{x}+8$	$y=\sqrt{x+4}-7$
$y=\frac{1}{x}$ $y=\frac{1}{x-6}$	$y=\frac{1}{x}+8$	$y=\frac{1}{x+4}-7$
$y=3^x$ $y=3^{x-6}$	$y=3^x+8$	$y=3^{x+4}-7$
$y=\sin x$ $y=\sin(x-6)$	$y=\sin x+8$	$y=\sin(x+4)-7$

Unit Function	Equations of translations	Horizontal & Vertical Translations
$y=f(x)$	$y = f(x-9)-8$ $y = a f(x-h) + k$	HT of 9 right and VT of 8 down HT = 9 VT = -8
$y = x^2$	$y = (x+2)^2 - 6$	HT of 2 left and VT of 6 down HT = -2
$y = x^3$	$y = (x-10)^3 + 3$	HT of 10 Right & VT of 3 up
$y = x $	$y = x+10 + 7$	HT = -10 HT of 10 left & VT of 7 up
$y = x$	$y = (x) + 4$	HT = 0 VT up 4 VT = 4
$y = x $	$y = x-17 - 9$	HT Right 17 HT = 17 VT $\Rightarrow$ 9 down = -9
$y = 3^x$	$y = 3^{x+2}$	HT = Left 2 or -2
$y = \sqrt{x}$	$y = \sqrt{x+1} + 9$	HT of 1 left VT of 9 up
$y = \sin x$	$y = \sin(x+8) - 2$	HT of 8 left VT of 2 down

Given $y = \sqrt{x}$

a) Graph $y = \sqrt{x+5}$

HT = Left 5

On same graph

b) Graph $y = \sqrt{x+5} - 7$

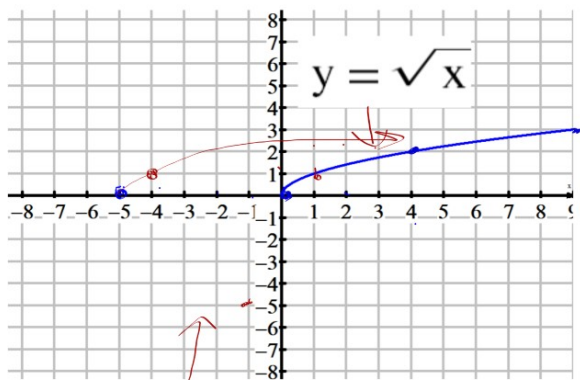
HT = 5 Left
VT = 7 down



Any Translations

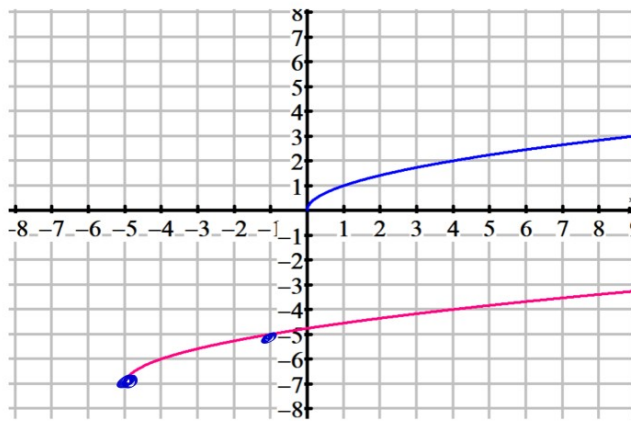


Solution



$$y = \sqrt{x+5}$$

left + 5



$$y = \sqrt{x+5} - 7$$

HT -5 5 left

VT -7 7 down

General formula	translated formula	translations (Directions)
$y = f(x)$	$y = f(x+8) - 2$	HT--> -8 (left 8) VT--> -2 (2 Down)
$y = \frac{1}{x}$	$y = \frac{1}{x-4} + 6$	HT--> 4 (Right 4) VT--> 6 (Up 6)
$y = 2^x$	$y = 2^x$	HT--> None VT--> None
$y = x^4$	$y = (x-5)^4 + 11$	HT--> 5 Right 5 VT--> 11 Up 11
$y = \cos x$	$y = \cos(x+10) - 8$	HT--> -10 (Left 10) VT--> -8 (Down)

$$y = \frac{1}{x-3} + 5$$

$$y = \sqrt{x-2}$$

$$y = |x| - 26$$



A mapping rule can be used to map a set of ordered pairs from a function onto a translated function

For Horizontal and Vertical translations

$$y = f(x-h) + k$$

horizontal translation

vertical translation



notice that the horizontal translation is opposite the sign of h

$$(x, y) \rightarrow (x+h, y+k)$$

Opposite sign

R.H.
Up K

Mapping Rule

$$y = (x-5)^2 - 8$$

$$HT = R5 (5)$$

$$VT = D8$$

$$y = x^2$$

mapping rule:

$$(x, y) \rightarrow (x+5, y-8)$$

$$y = x^2$$

x	y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9

x	y
2	9
3	4
4	1
5	0
6	1
7	4
8	9

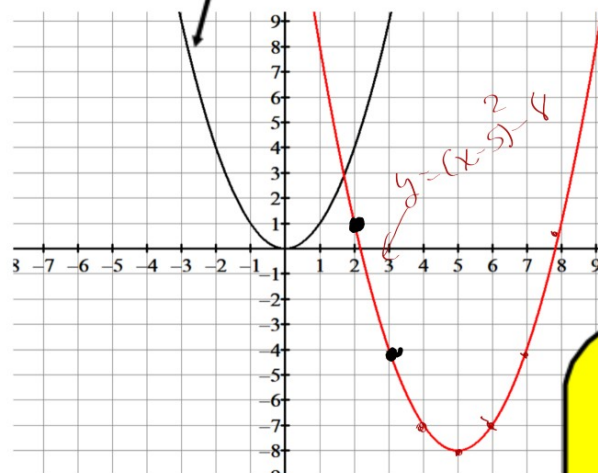


Table 1.docx

horizontal translation HT Left 7	vertical translation VT Down 3	HT Right 5 VT Up 9
$y=f(x)$		
$y = x^2$		
$y = x^3$		
$y = x $		
$y=\sqrt{x}$		
$y = \frac{1}{x}$		
$y = 3^x$		
$y = \sin x$		

Do we need more?

	 Vertical Translation	 Horizontal Translation
$f(x) = \cos(x - 3) + 6$		
$f(x) = (x - 7)^3 - 9$		
$y = 9^{x+8} - 12$		
$y = \sqrt{x + 10} + 4$		
$f(x) = \cos(x - 3) + 6$		
$f(x) = (x + 5.7)^2 - 2$		
$y = x - 15$		
$y = \tan(x + 9)$		
$y = f(x - 8) + 4$		