Math 11U **Lesson 3/4 Transformations of Functions** **Name:_____**

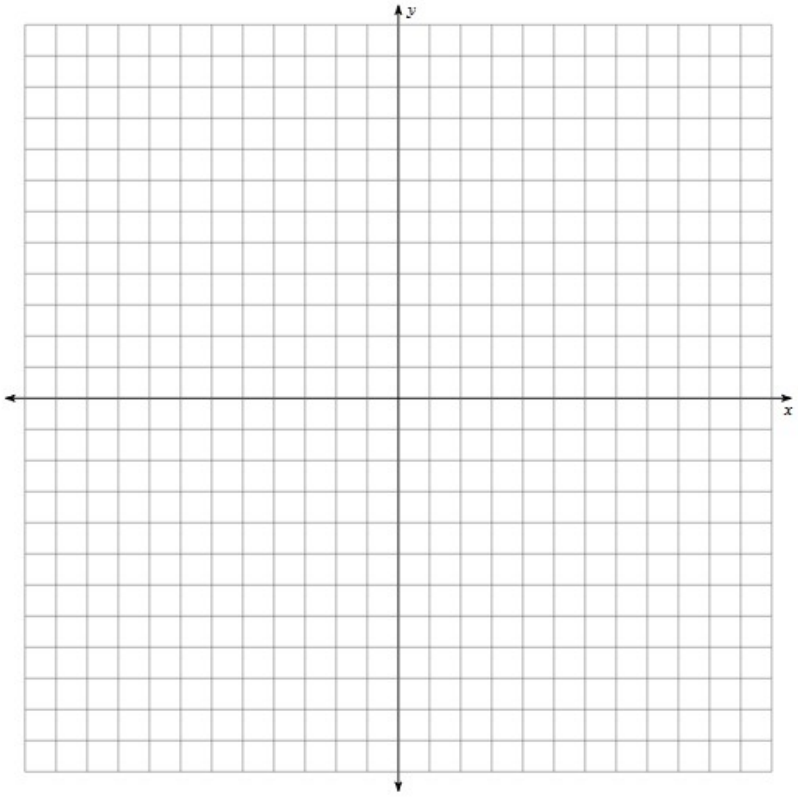
Instructions: For this booklet, fill in all the boxes given the original function. Do any calculations on the following blank page or on a separate piece of paper. When you graph, create a scale that works. All the transformed points do not need to be graphed, but the more the merrier. Let's do an example!

Function	Proper Function $f(\mathrm{x}) = \mathrm{a}\, f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$e(x) = 2\sqrt{-3x+12}-6$					

Domain		Range		y-int (x=0)	

	Parent Function:		Transformed Function	
Table Of Values				

Graph both the parent function and the transformed function.



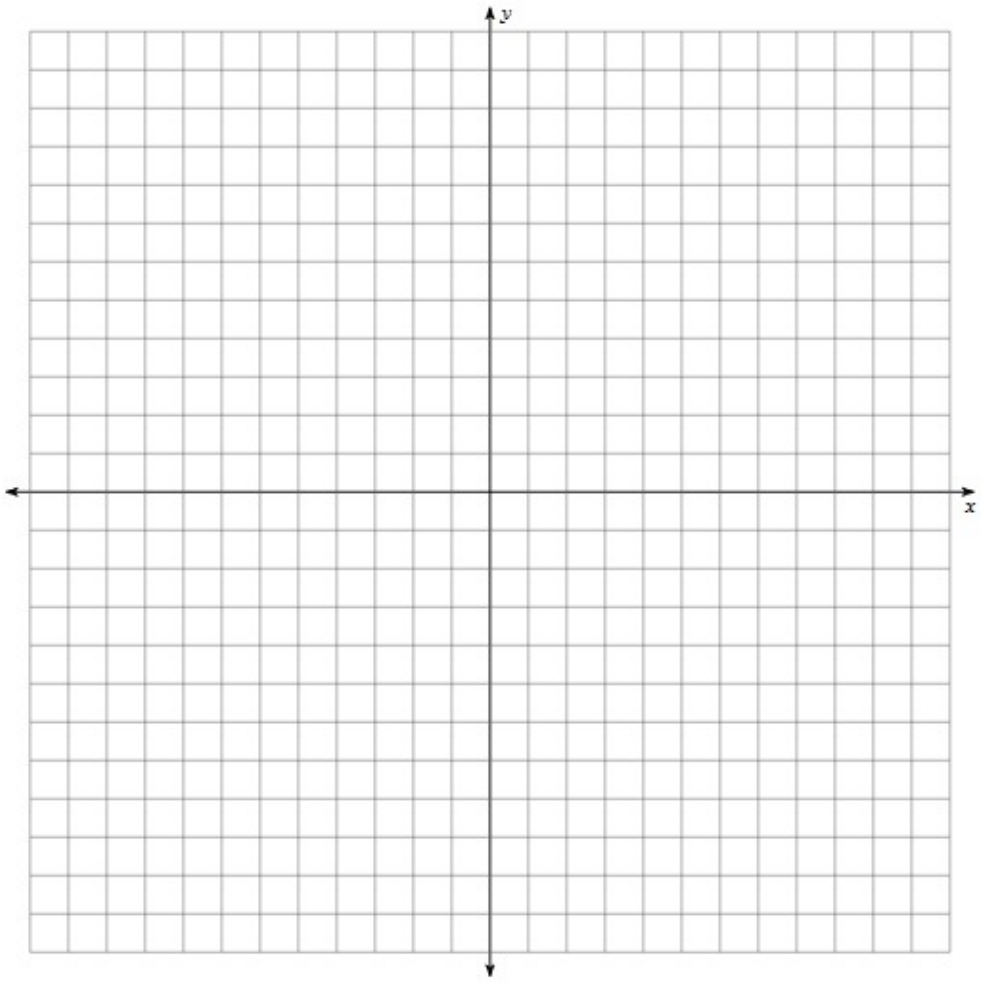
Do work here if required.

Function	Proper Function $f(x) = a\, f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$f(x) = 2(x-4)^2 - 3$					

Domain		Range		y-int (x=0)	

	Parent Function:		Transformed Function	
Table Of Values				

Graph both the parent function and the transformed function.

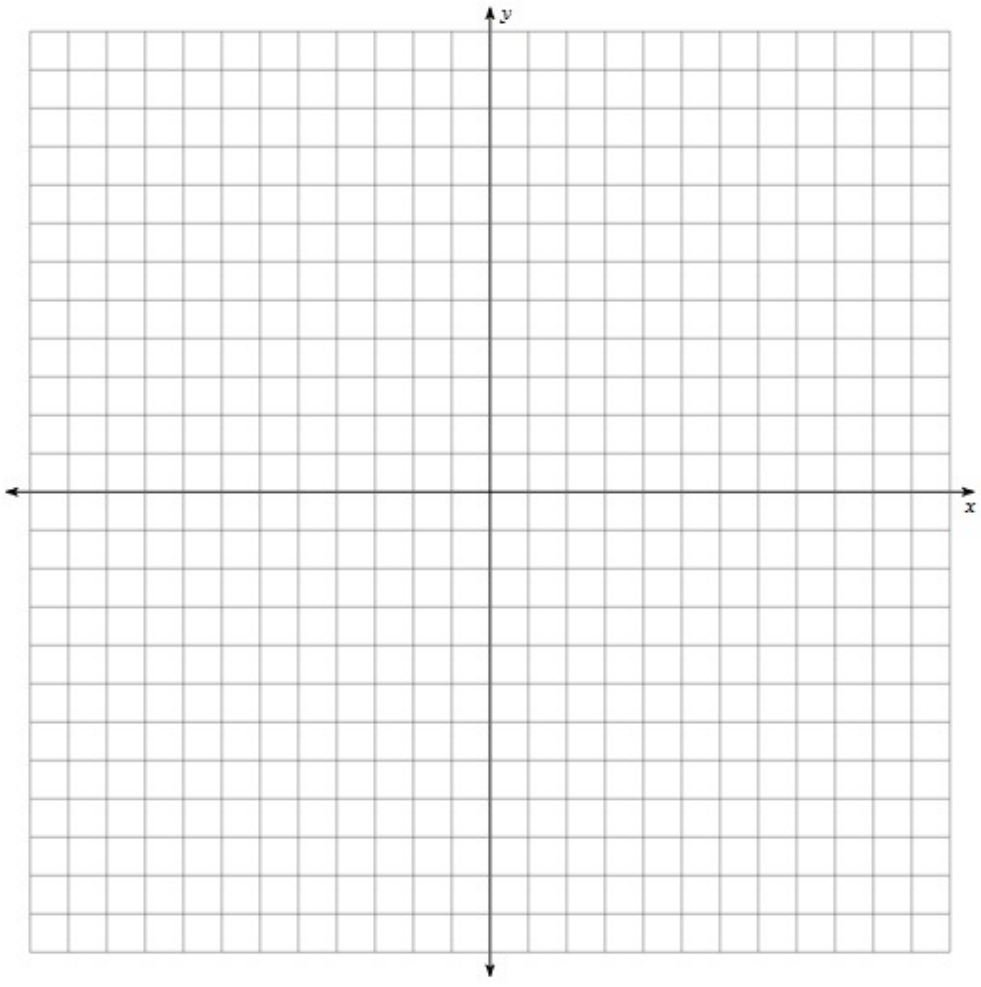


Function	Proper Function $f(x) = a\,f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$g(x) = -3\sqrt{2x+8}+7$					

Domain		Range		y-int (x=0)	

	Parent Function:		Transformed Function	
Table Of Values				

Graph both the parent function and the transformed function.



$f(x) = a\,g(k(x-d)) + c$ $\quad h(0) = 5|0+2|-8 = 2$

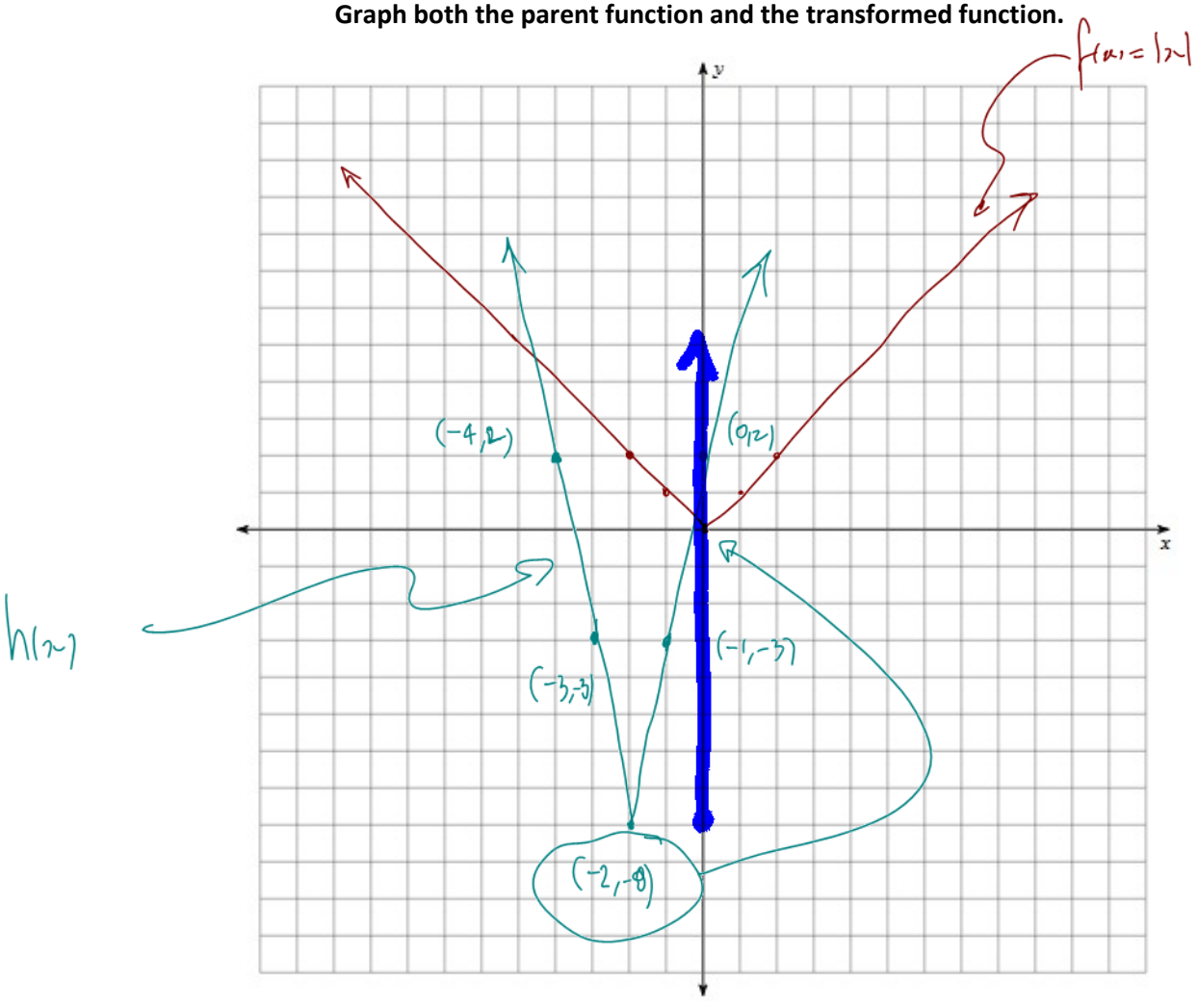
Function	Proper Function $f(x) = a\,f(k(x-d))+c$	Vertical Stretch **a**	Horizontal Stretch **1/k**	Horizontal Shift **d**	Vertical Shift **c**
$h(x) = 5\|x+2\|-8$ ($k=1$)	$h(x) = 5\,\|x+2\| - 8$ (5: V, +2: H, −8: V)	5	1	(−2) 2 left	(−8) 8 down

Domain	$\{x \in \mathbb{R}\}$	Range	$\{h(x) \in \mathbb{R} \mid h(x) \geq -8\}$	y-int (x=0)	(0, 2)

Table Of Values

Parent Function: $f(x) = \|x\|$		Transformed Function	
x_p	$f = \|x_p\|$	$x_t = 1x_p - 2$	$h(x) = 5f - 8$
−2	2 (|−2|)	−4	2 (−4, 2)
−1	1	−3	−3 (−3, −3)
0	0	−2	−8
1	1	−1	−3
2	2	0	2

Graph both the parent function and the transformed function.



$3 \div \frac{1}{2} = 3 \times \frac{2}{1} = 6$

$k(0) = \frac{3}{\frac{1}{2}(0-6)} + 5 = 4$

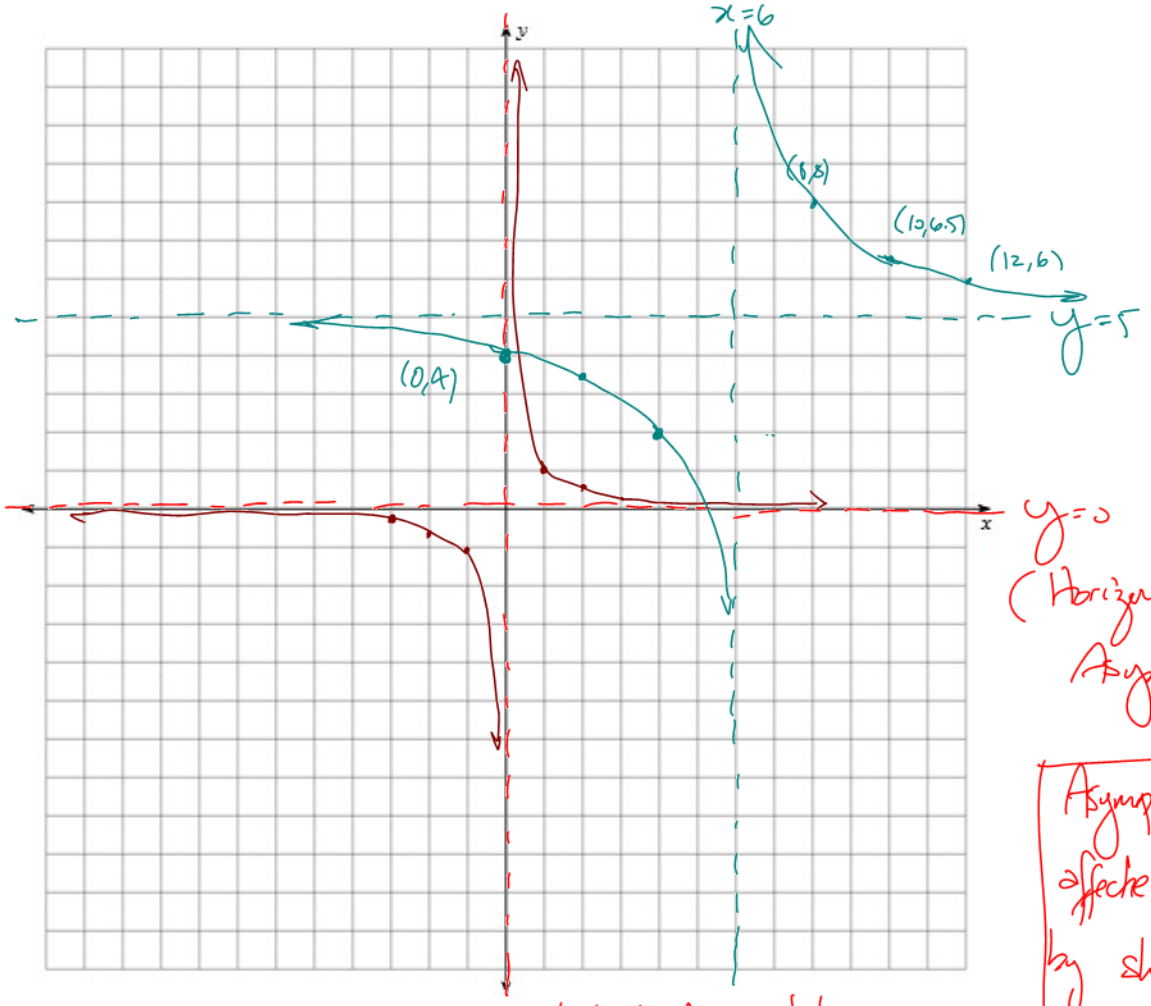
Function	Proper Function $f(x) = a\,f\left(k(x-d)\right)+c$	Vertical Stretch **a**	Horizontal Stretch **1/k**	Horizontal Shift **d**	Vertical Shift **c**
$k(x) = \frac{3}{\frac{1}{2}x-3}+5$	$k(x) = \frac{3}{\frac{1}{2}(x-6)}+5$	×3	×2	6 right (+6)	5 up

Domain	$\{x \in \mathbb{R} \mid x \neq 6\}$	Range	$\{k(x) \in \mathbb{R} \mid k(x) \neq 5\}$	y-int (x=0)	(0, 4)

Asymptotes

Table Of Values	Parent Function: $f = \frac{1}{x}$		Transformed Function $k(x) = \frac{3}{\frac{1}{2}(x-6)}+5$	
	x_p	$f = \frac{1}{x_p}$	$x_T = 2x_p + 6$	$k = 3f + 5$
	−3	$-\frac{1}{3}$	0	4 $(-\frac{1}{3}(3)+5)$
	−2	$-\frac{1}{2}$	2	3.5
	−1	−1	4	2
	1	1	8	8
	2	$\frac{1}{2}$	10	6.5
	3	$\frac{1}{3}$	12	6

Graph both the parent function and the transformed function.



V.A.
Shifted right 6

H.A.
Shifted up 5

y=0 (Horizontal Asymptote)

x=0 Vertical Asymptote

Asymptotes are affected only by shifts

y-int $m(0) = -4(2\cdot 6)^2 + 7$

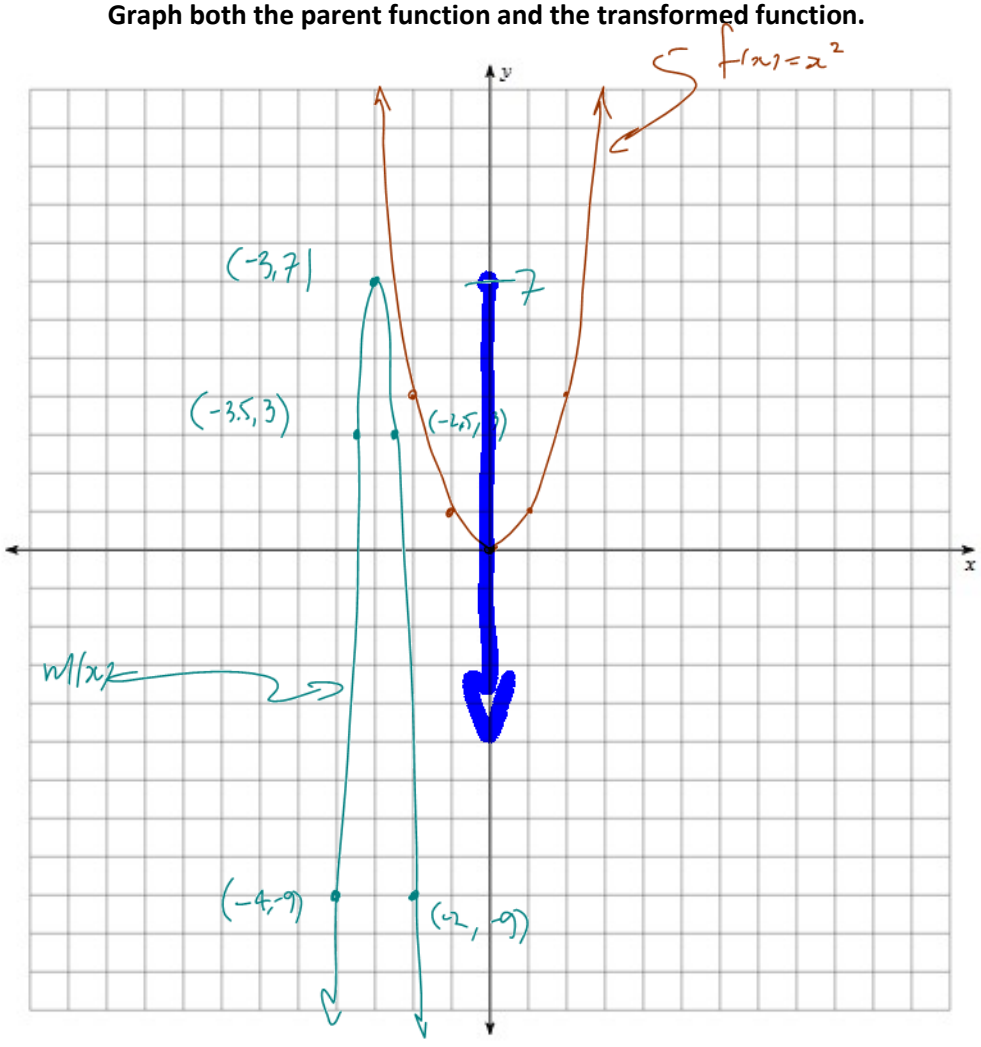
Function	Proper Function $f(x) = a\,f\big(k(x-d)\big)+c$	Vertical Stretch **a**	Horizontal Stretch **1/k**	Horizontal Shift **d**	Vertical Shift **c**
$m(x) = -4(2x+6)^2 + 7$	$m(x) = -4\left[2(x+3)\right]^2 + 7$ (2: H, 3: H)	-4	$\frac{1}{2}$	-3 or (3 to LEFT)	7 up

Domain	$\{x \in \mathbb{R}\}$	Range	$\{m(x) \in \mathbb{R} \mid m(x) \le 7\}$	y-int (x=0)	$(0, -137)$

Table Of Values

Parent Function: $f(x) = x^2$		Transformed Function	
x_p	f	$x_t = \frac{1}{2}x_p - 3$	$m(x) = -4f(x) + 7$
-2	4	$\frac{1}{2}(-2) - 3 = -1 - 3 = -4$	-9
-1	1	-3.5	3
0	0	-3	7
1	1	-2.5	3
2	4	-2	-9

Graph both the parent function and the transformed function.

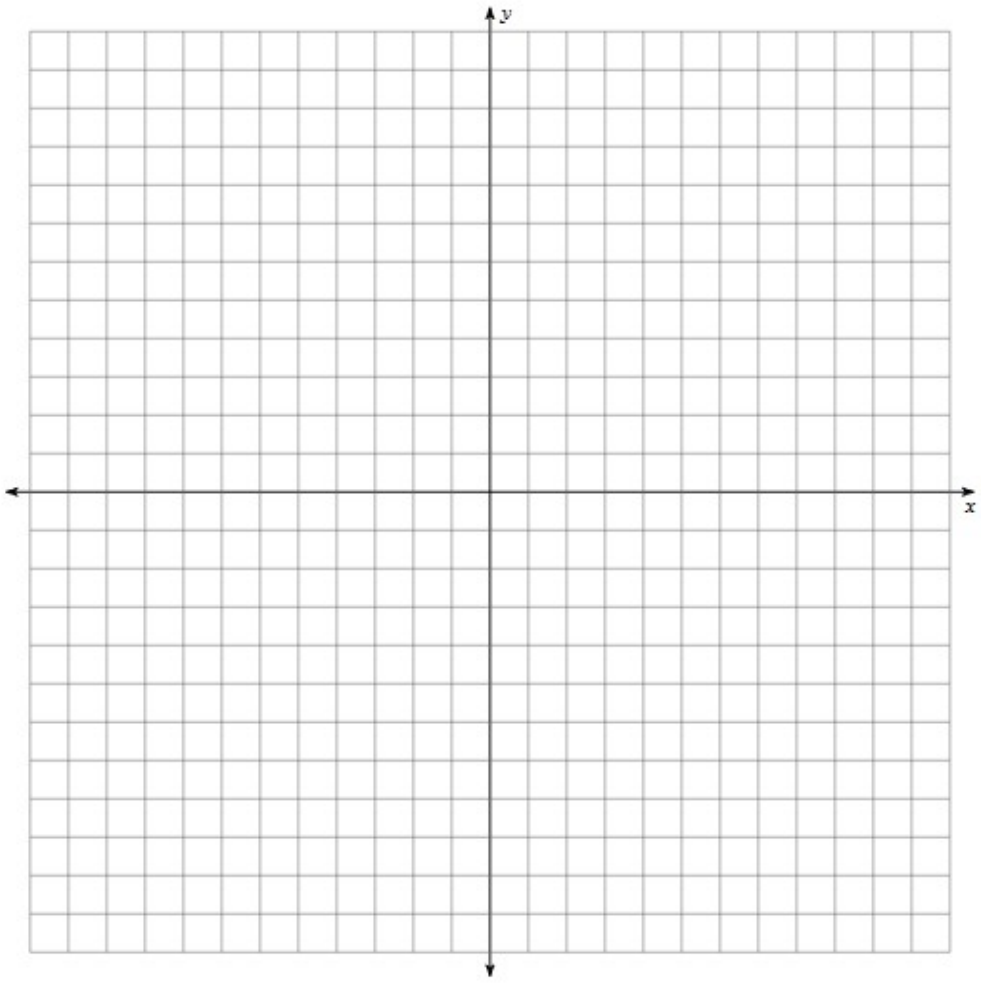


Function	Proper Function $f(x) = a\,f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$n(x) = 5\sqrt{0.4x-1}-3$					

Domain		Range		y-int (x=0)	

	Parent Function:		Transformed Function	
Table Of Values				

Graph both the parent function and the transformed function.



y-int $\Rightarrow x=0$: $p(0) = -3\left|\frac{2}{3}(0)+2\right|-2 = -8$ $(0,-8)$

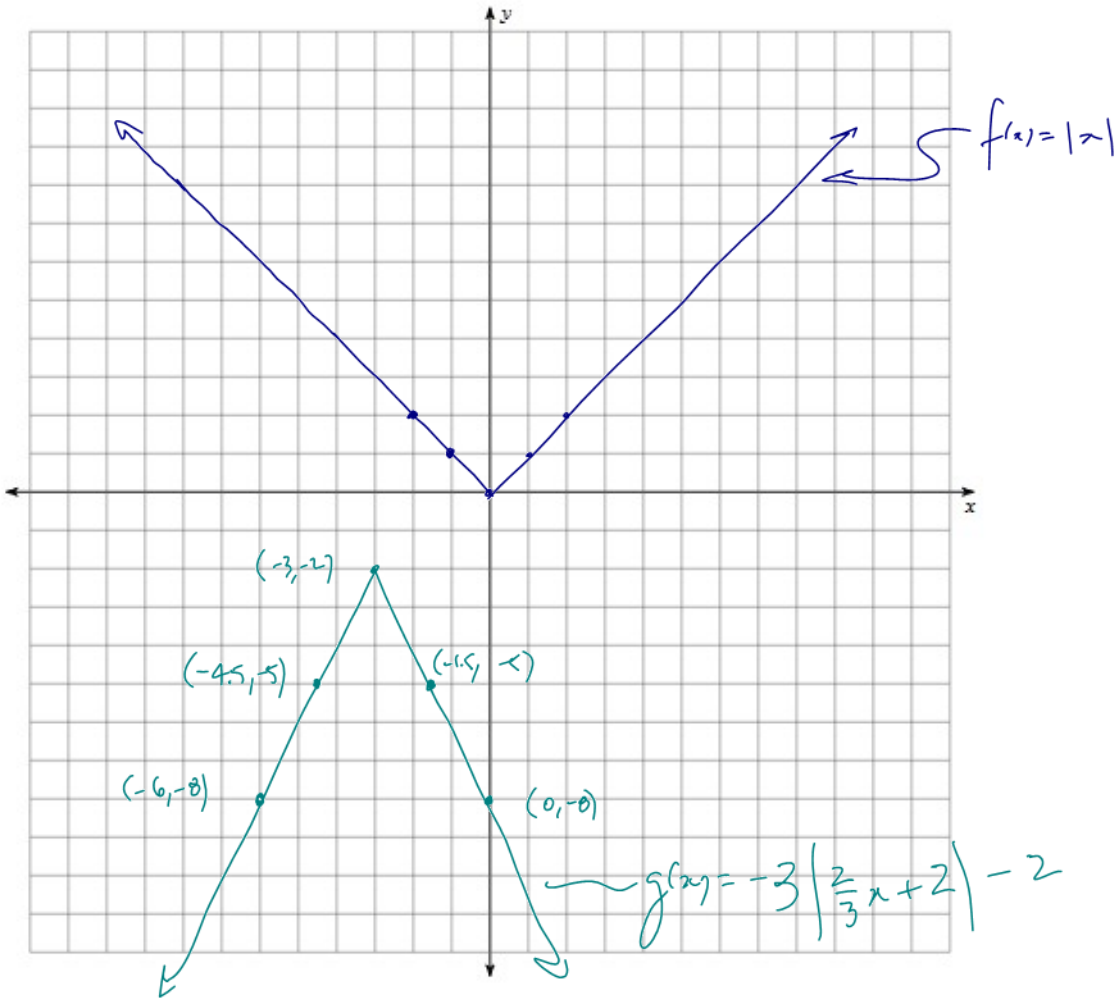
Function	Proper Function $f(x) = a\,f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$p(x) = -3\left\|\frac{2}{3}x+2\right\|-2$	$p(x) = -3\left\|\frac{2}{3}(x+3)\right\|-2$	-3	$\frac{3}{2}$	-3	-2

Domain	$D_p: \{x \in \mathbb{R}\}$	Range	$\{p(x) \in \mathbb{R} \mid p(x) \le -2\}$	y-int (x=0)	-8

Table Of Values

Parent Function: $f(x) = \|x\|$		Transformed Function	
x_p	f	$x_T = \frac{3}{2}x_p - 3$	$p(x) = -3f - 2$
-2	2	-6	-8
-1	1	-4.5	-5
0	0	-3	-2
1	1	-1.5	-5
2	2	0	-8

Graph both the parent function and the transformed function.

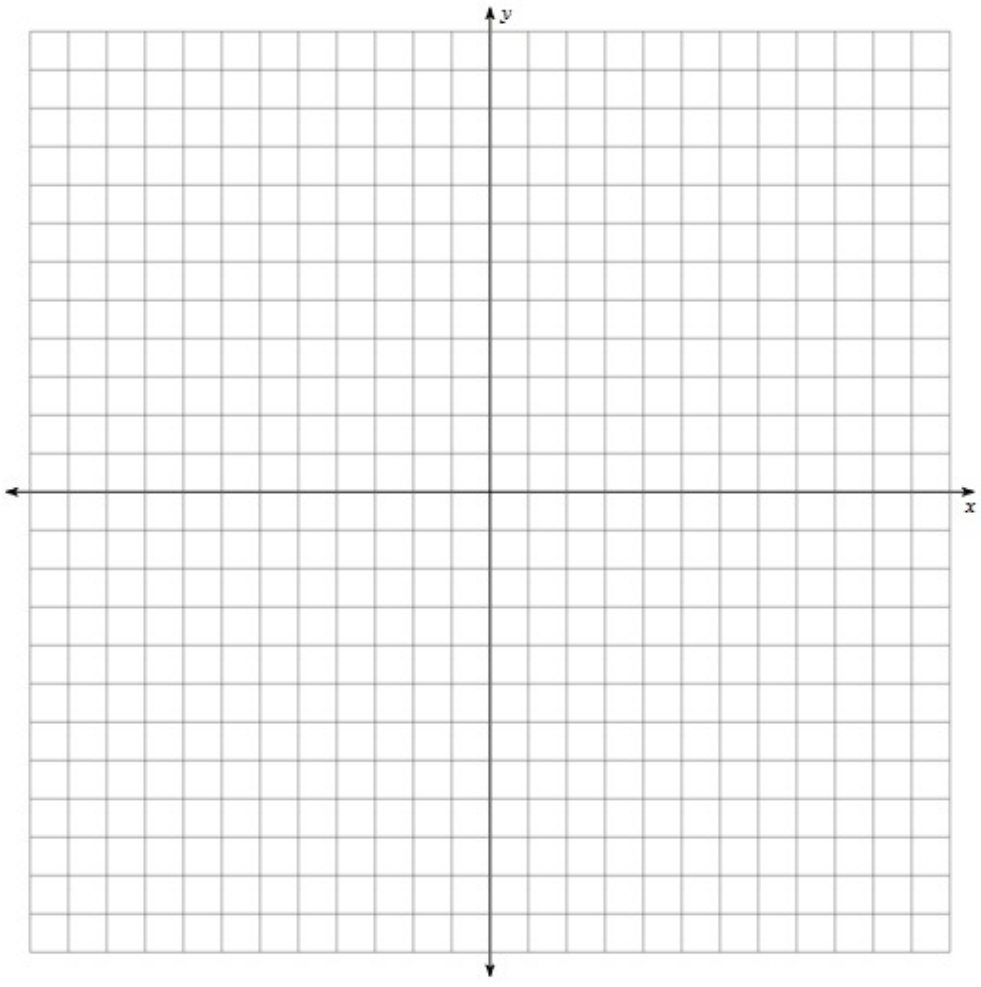


Function	Proper Function $f(x) = a\, f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$r(x)=\dfrac{-2}{-x+4}-6$					

Domain		Range		y-int (x=0)	

	Parent Function:		Transformed Function	
Table Of Values				

Graph both the parent function and the transformed function.

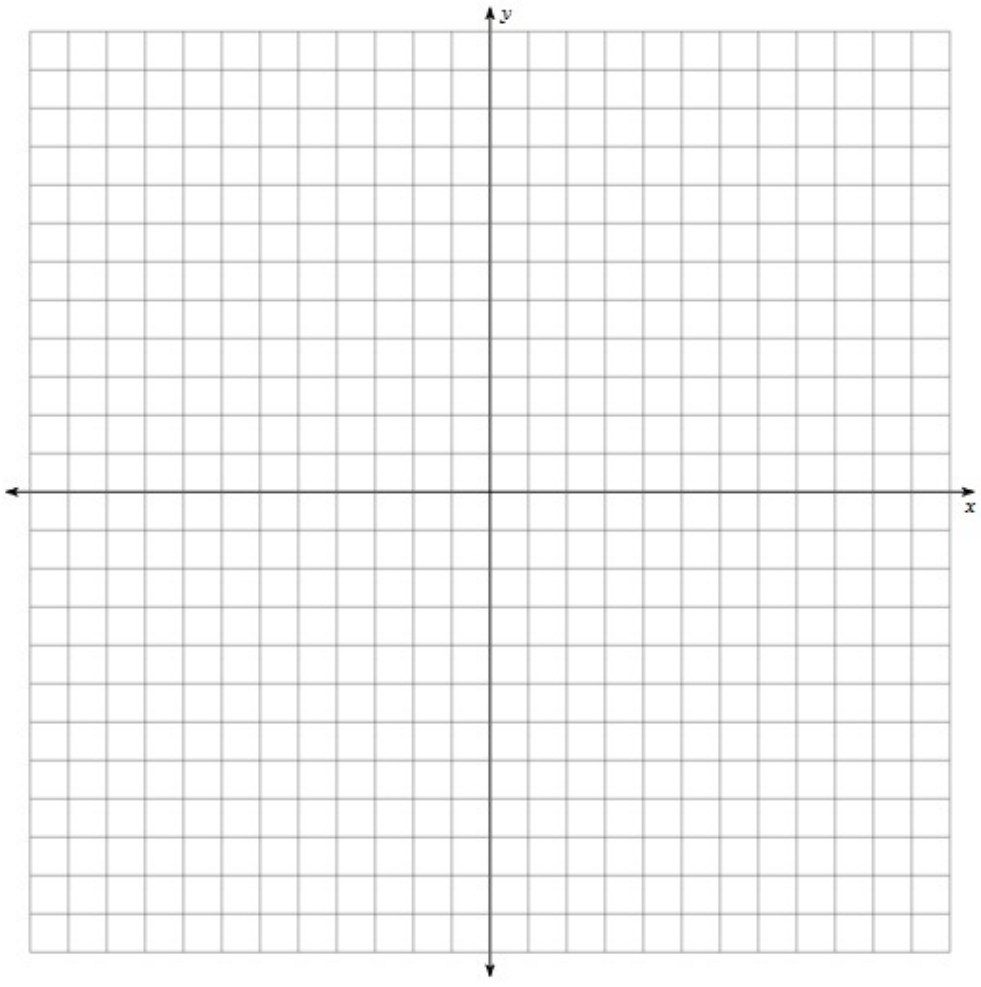


Function	Proper Function $f(x) = a\, f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$u(x)=\frac{3}{2}(x+7)^2-10$					

Domain		Range		y-int (x=0)	

	Parent Function:		Transformed Function	
Table Of Values				

Graph both the parent function and the transformed function.



$10 \div -\frac{5}{2} = 10 \times -\frac{2}{5} = -4$ || $w(0) = -\frac{3}{4}\sqrt{-\frac{5}{2}(-4)} + 3 = -\frac{3}{4}\sqrt{10} + 3 = 0.63$

Function	Proper Function $f(x) = a\,f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$w(x) = \frac{-3}{4}\sqrt{\frac{-5}{2}x+10}+3$ ~~+3~~	$w(x) = -\frac{3}{4}\sqrt{-\frac{5}{2}(x-4)}+3$ (H, H, V, V)	$-\frac{3}{4}$	$-\frac{2}{5}$	4 right	3 up

Domain	$\{x \in \mathbb{R} \mid x \le 4\}$	Range	$\{w(x) \in \mathbb{R} \mid w(x) \le 3\}$	y-int (x=0)	$(0, 0.63)$

Table Of Values

Parent Function: $f(x) = \sqrt{x}$ | Transformed Function $w(x) = -\frac{3}{4}\sqrt{-\frac{5}{2}(x-4)}+3$

x_p	$f = \sqrt{x_p}$	$x_T = -\frac{2}{5}(x_p) + 4$	$w = \frac{-3}{4}f + 3$
0	0	4	3
1	1	$(\frac{18}{5})$ 3.6	$(\frac{9}{4})$ 2.25
4	2	$(\frac{12}{5})$ 2.4	$(\frac{3}{2})$ 1.5
9	3	$(\frac{2}{5})$ 0.4	$(\frac{3}{4})$ 0.2

Graph both the parent function and the transformed function.