Math 11U **1.8 Transformations of Functions** **Name:**_____

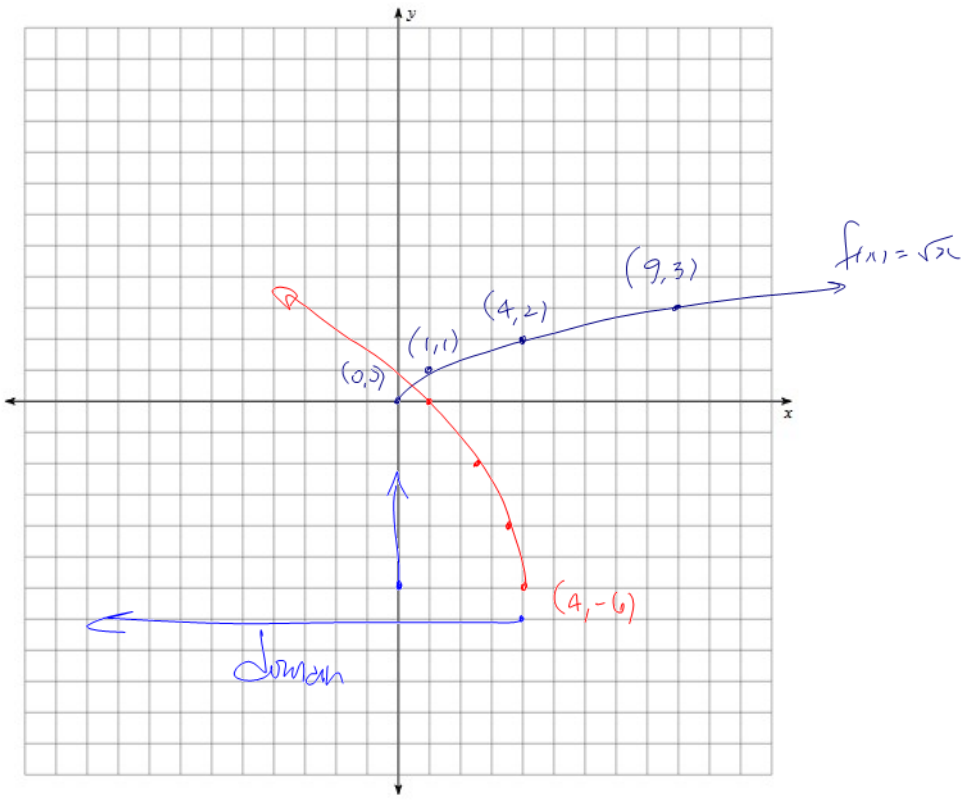
Instructions: For this booklet, fill in all the boxes given the original function. Do any calculations on the following blank page or on a separate piece of paper. When you graph, create a scale that works. All the transformed points do not need to be graphed, but the more the merrier. Let's do an example!

Function	~~Proper Function~~ STANDARD FORM $f(x) = a\,f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$e(x) = 2\sqrt{-3x+12} - 6$	$e(x) = 2\sqrt{-3(x-4)} - 6$	2	$-\frac{1}{3}$	4 right	6 down

Domain	$D_e = \{x \in \mathbb{R} \mid x \le 4\}$	Range	$R_e = \{e(x) \in \mathbb{R} \mid e(x) \ge -6\}$	y-int (x=0)	$e(0) = 2\sqrt{12} - 6 = 0.93$

	Parent Function: $f(x) = \sqrt{x}$		Transformed Function	
	x_p	f	$x_t = -\frac{1}{3}(x_p) + 4$	$e = 2(f) - 6$
Table Of Values	0	0	4	−6
	1	1	$(-\frac{1}{3})(1)+4 \doteq 3.67$	−4
	4	2	2.67	−2
	9	3	1	0

Graph both the parent function and the transformed function.



Do work here if required.

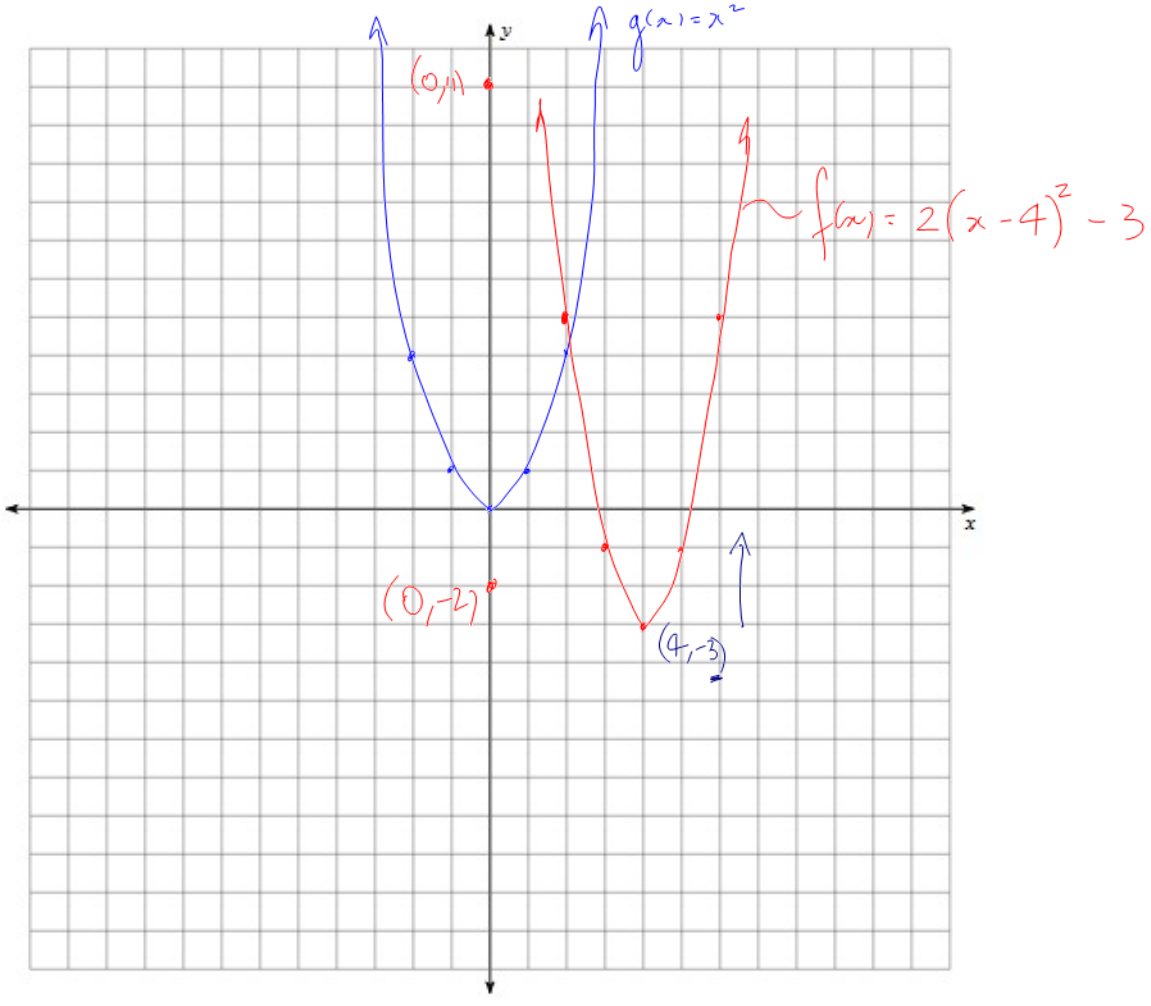
Function	~~Proper Function~~ Standard form $f(x)=a\,f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$f(x)=2(x-4)^2-3$	$f(x)=2(x-4)^2-3$	×2	$k=1$ ×1	4 (+4) right	3 down -3

Domain	$\{x\in\mathbb{R}\}$	Range	$\{f(x)\in\mathbb{R} \mid f(x)\geq -3\}$	y-int (x=0)	29

Table Of Values

Parent Function: $g(x)=x^2$		Transformed Function	
x_p	$g(x)=x^2$	$x_t=x_p+4$	$f=2g-3$
-2	$(-2)^2=4$	2	5
-1	1	3	-1
0	0	4	-3
1	1	5	-1
2	4	6	5

Graph both the parent function and the transformed function.



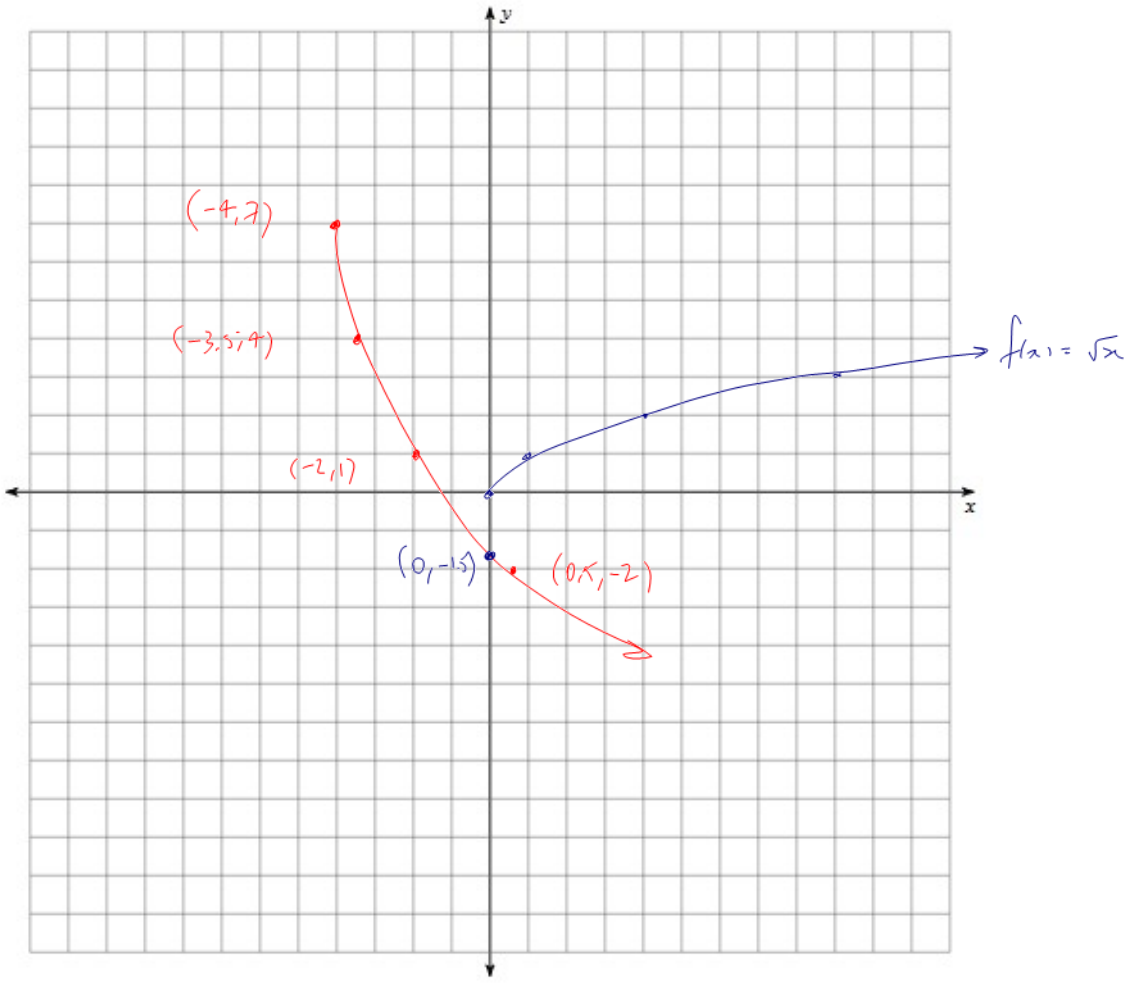
Function	~~Proper Function~~ Standard form $f(x) = a\,f\left(k(x-d)\right)+c$	Vertical Stretch **a**	Horizontal Stretch **1/k**	Horizontal Shift **d**	Vertical Shift **c**
$g(x) = -3\sqrt{2x+8}+7$	$g(x) = -3\sqrt{2(x+4)}+7$	-3	$\times \frac{1}{2}$	left 4 (-4)	7 (+7) up

Domain	$D_g = \{x \in \mathbb{R} \mid x \geq -4\}$	Range	$\{g(x) \in \mathbb{R} \mid g(x) \leq 7\}$	y-int (x=0)	-1.5

Table Of Values

Parent Function: $f(x) = \sqrt{x}$		Transformed Function	
x_p	$f(x) = \sqrt{x}$	$x_T = \frac{1}{2}(x_p) - 4$	$g = -3f + 7$
0	0	-4	7
1	1	-3.5	4
4	2	-2	1
9	3	0.5	-2

Graph both the parent function and the transformed function.



standard form

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***
$h(x)=5\lvert x+2\rvert-8$	$h(x)=5\lvert x+2\rvert-8$	$\times 5$	1	(-2) 2 left	8 down (-8)

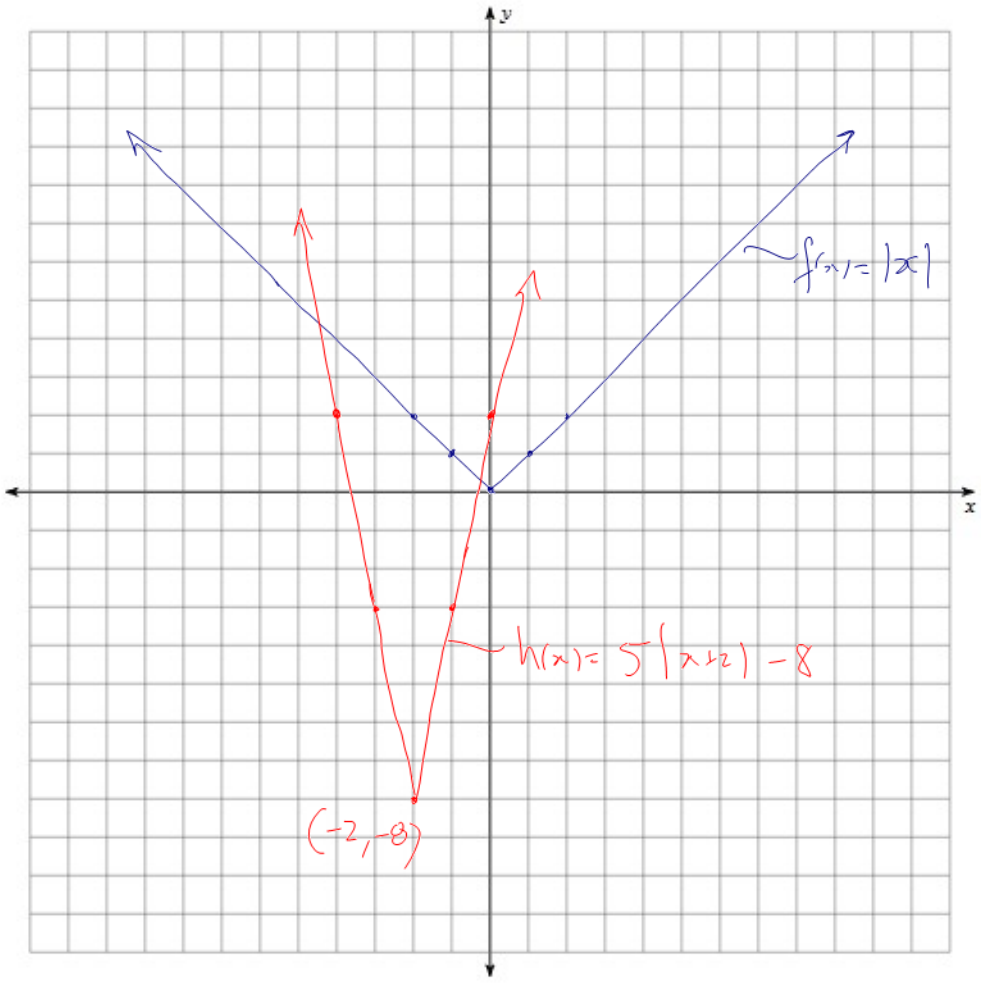
Domain	$D_h:\{x\in\mathbb{R}\}$	Range	$R_h=\{h(x)\in\mathbb{R}\mid h(x)\geq -8\}$	y-int (x=0)	$(0,2)$

Table Of Values

Parent Function: $f(x)=|x|$

x_p	$f(x)=\lvert x\rvert$	$x_T=(1)x_p-2$	$h(x)=5(f(x))-8$
-2	2	-4	2
-1	1	-3	-3
0	0	-2	-8
1	1	-1	-3
2	2	0	2

Graph both the parent function and the transformed function.



$4 \div \frac{1}{2} = 4 \times \frac{2}{1} = 8$

Standard form

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**
$k(x) = \frac{3}{\frac{1}{2}x-4}+5$	$k(x) = 3\left(\frac{1}{\frac{1}{2}(x-8)}\right)+5$	$\times 3$	$\frac{1}{\frac{1}{2}} = \times 2$	8 right $+8$	$+5$ (5 up)

Domain	$\{x \in \mathbb{R} \mid x \neq 8\}$	Range	$\{k(x) \in \mathbb{R} \mid k(x) \neq 5\}$	y-int (x=0)	4.25

no V.A. No H.A.

Table Of Values

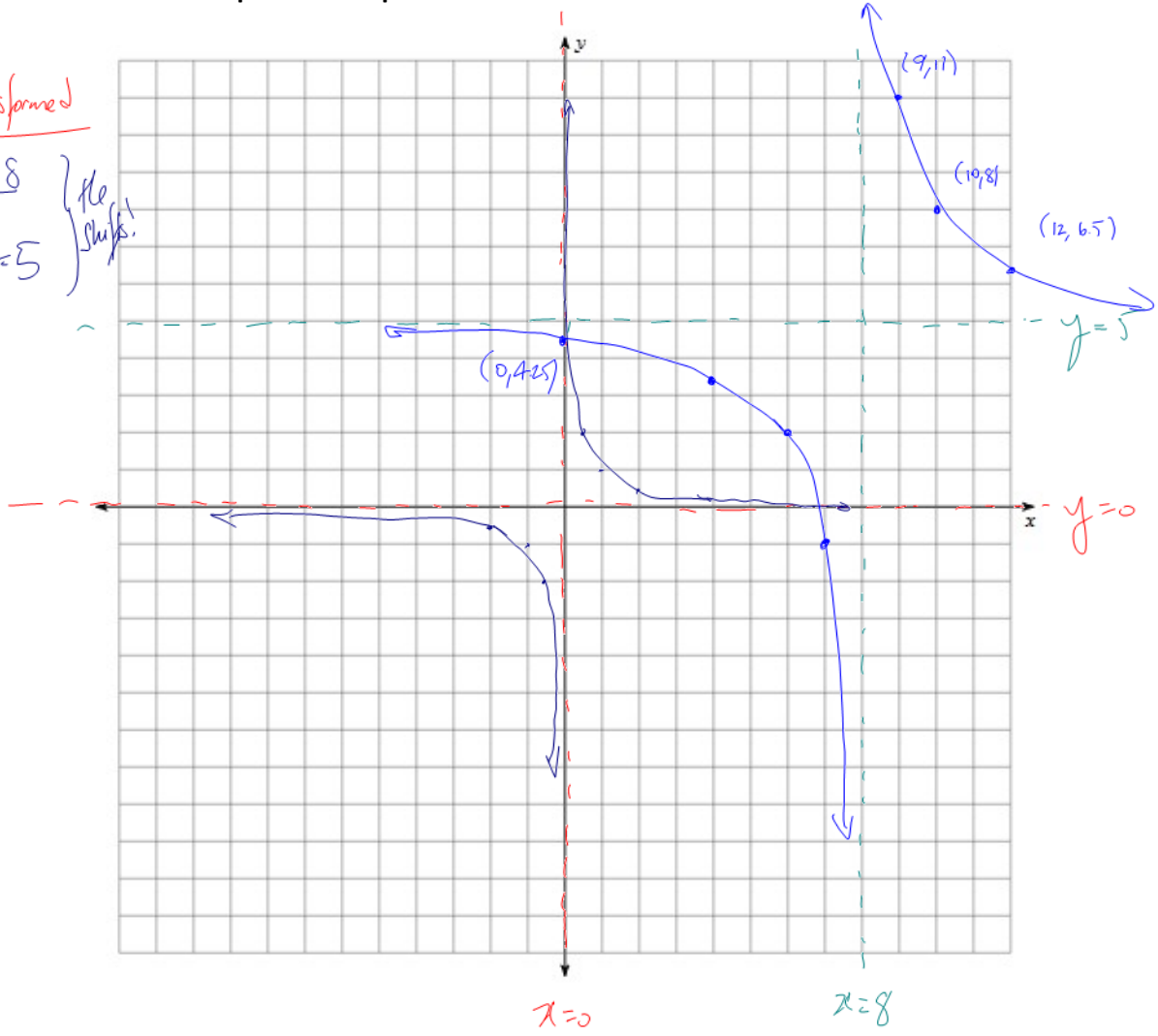
Parent Function: $f(x) = \frac{1}{x}$

x_p	$f(x) = \frac{1}{x}$	$x_T = 2x_p + 8$	$k(x) = 3f(x) + 5$
-2	$-\frac{1}{2}$	4	3.5
-1	-1	6	2
$-\frac{1}{2}$	-2	7	-1
$\frac{1}{2}$	2	9	11
1	1	10	8
2	$\frac{1}{2}$	12	6.5

Graph both the parent function and the transformed function.

Asymptotes

parent	Transformed	
$x=0$	$x=8$	the shifts!
$y=0$	$y=5$	



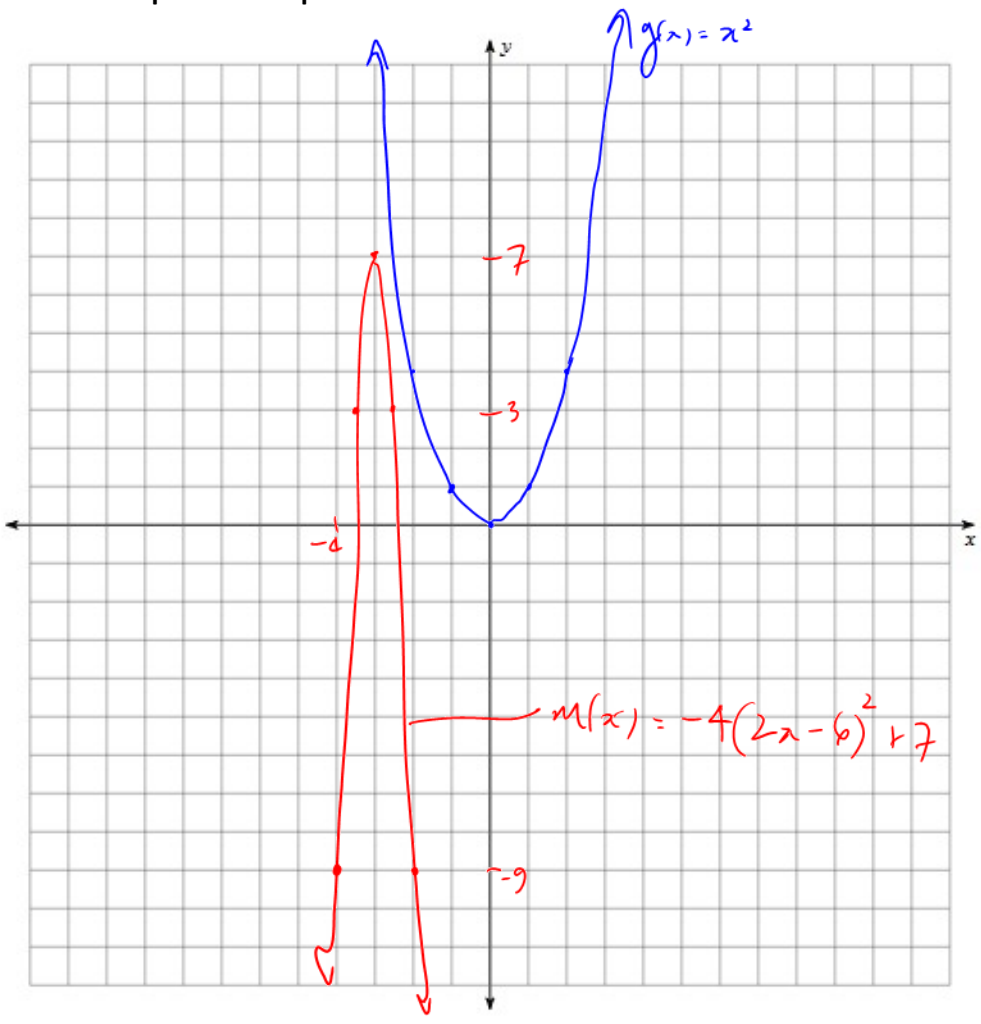
Function	Proper Function $f(x)=a\,f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$m(x)=-4(2x+6)^2+7$	$m(x)=-4\left(2(x+3)\right)^2+7$	-4	$\frac{1}{2}$	3 left	7 up

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

Table Of Values

Parent Function: $g(x)=x^2$		Transformed Function	
x_p	g	$x_T=\frac{1}{2}x_p-3$	$m=-4g+7$
-2	4	-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.



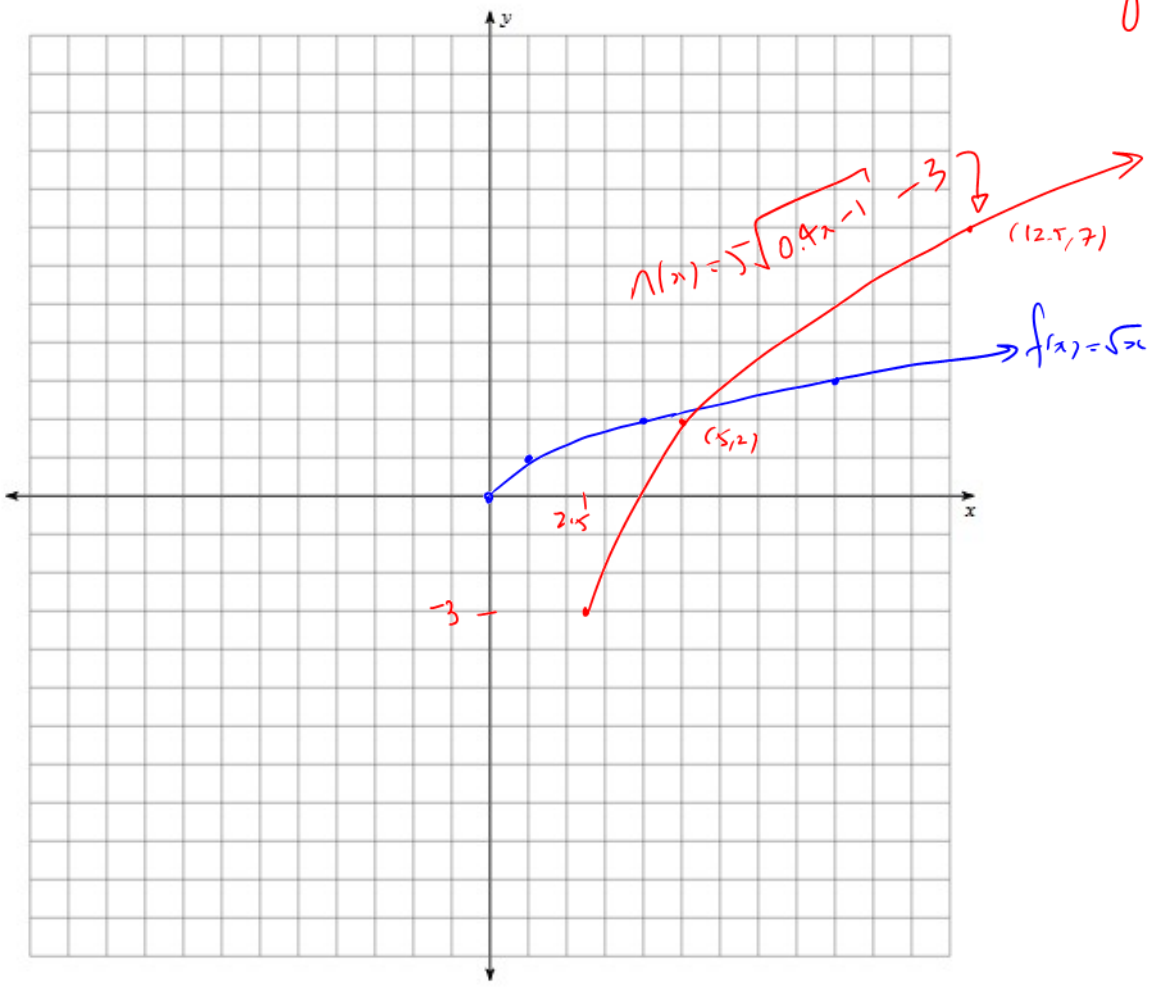
Function	Proper Function $f(x) = a\,f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$n(x) = 5\sqrt{0.4x-1}-3$	$n(x) = 5\sqrt{0.4(x-2.5)}-3$	5	$\frac{1}{0.4} = 2.5$	2.5 right	3 down

Domain	$\{x \in \mathbb{R} \mid x \geq 2.5\}$	Range	$\{n(x) \in \mathbb{R} \mid n(x) \geq -3\}$	y-int (x=0)	d.n.e. (does not exist)

Table Of Values

Parent Function: $f(x) = \sqrt{x}$		Transformed Function	
x_p	f	$x_t = 2.5x_p + 2.5$	$n = 5f - 3$
0	0	2.5	−3
1	1	5	2
4	2	12.5	7
9	3	25	12 (off the grid)

Graph both the parent function and the transformed function.



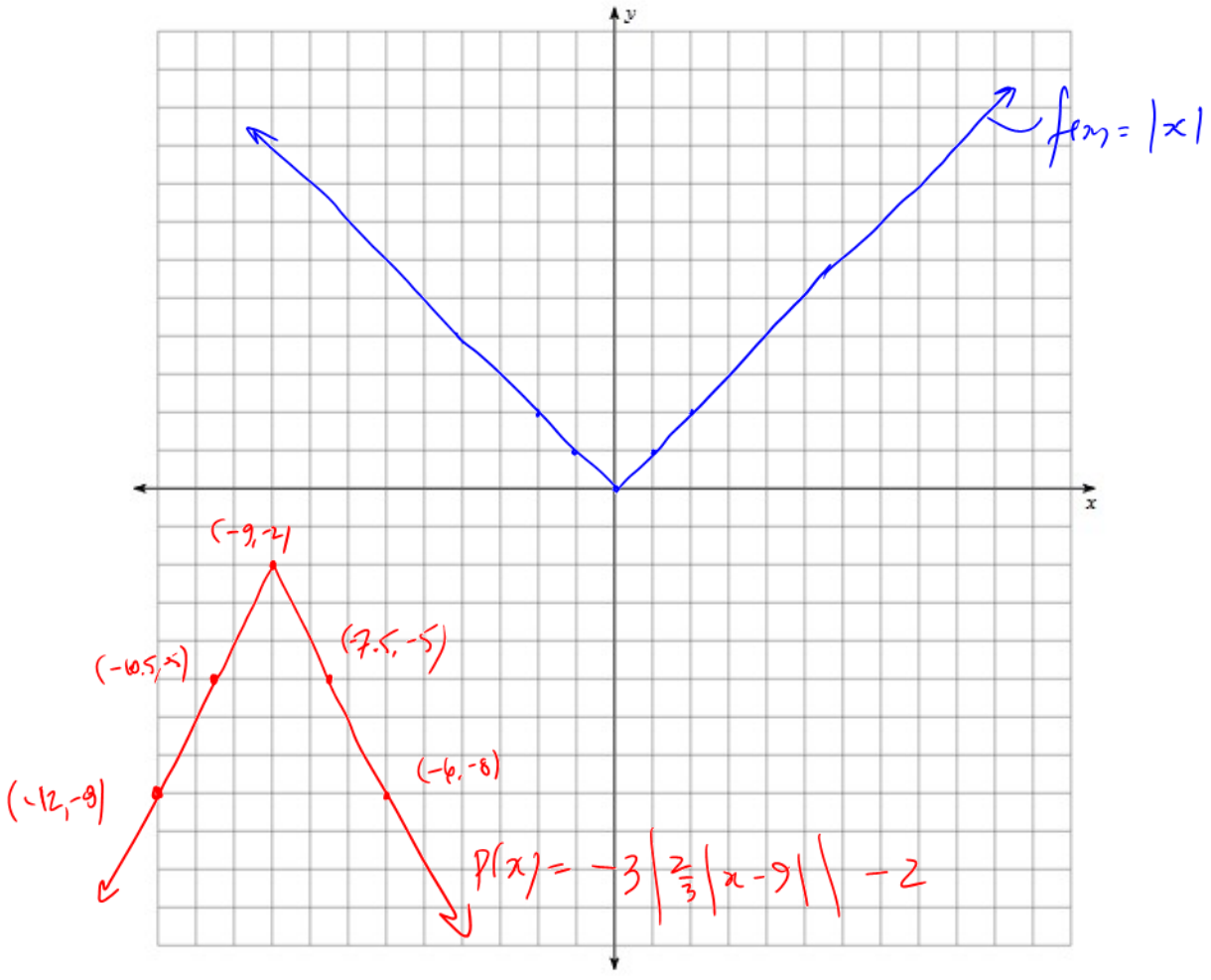
Function	Proper Function $f(x)=a\,f\left(k(x-d)\right)+c$	Vertical Stretch **a**	Horizontal Stretch **1/k**	Horizontal Shift **d**	Vertical Shift **c**
$p(x)=-3\left\|\frac{2}{3}x+6\right\|-2$	$p(x)=-3\left\|\frac{2}{3}(x+9)\right\|-2$	-3	$\frac{3}{2}$	9 left	2 down

Domain	$\{x\in\mathbb{R}\}$	Range	$\{p(x)\in\mathbb{R} \mid p(x)\le -2\}$	y-int (x=0)	-20

Table Of Values

Parent Function: $f(x)=\|x\|$		Transformed Function	
x_p	f	$x_t=\frac{3}{2}x_p-9$	$p=-3f-2$
-2	2	-12	-8
-1	1	-10.5	-5
0	0	-9	-2
1	1	-7.5	-5
2	2	-6	-8

Graph both the parent function and the transformed function.



Standard form

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**
$r(x)=\dfrac{-2}{-x+4}-6$	$r(x)=-2\left(\dfrac{1}{-(x-4)}\right)-6$	$\times(-2)$	$\times -1$	$+4$	-6 (6 down)

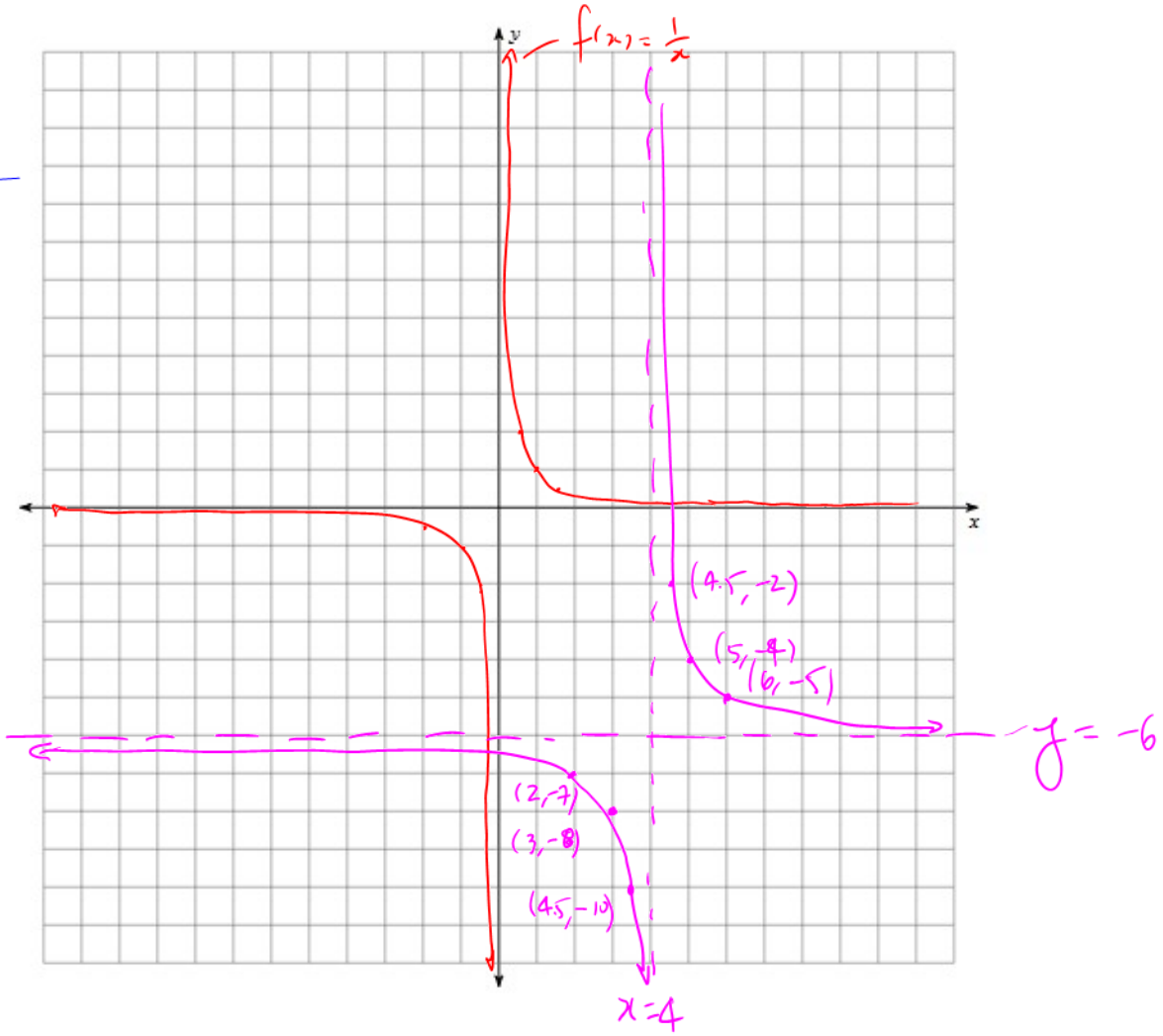
Domain		Range		y-int (x=0)	-6.5

	Parent Function: $f(x)=\frac{1}{x}$		Transformed Function	
	x_p	$f(x)=\frac{1}{x}$	$x_T=-x_p+4$	$r(x)=-2f(x)-6$
Table Of Values	-2	$-\frac{1}{2}$	6	-5
	-1	-1	5	-4
	$-\frac{1}{2}$	-2	4.5	-2
	$\frac{1}{2}$	2	3.5	-10
	1	1	3	-8
	2	$\frac{1}{2}$	2	-7

Graph both the parent function and the transformed function.

Asymptotes

Parent	Transformed
H: $y=0$	$y=-6$
V: $x=0$	$x=4$



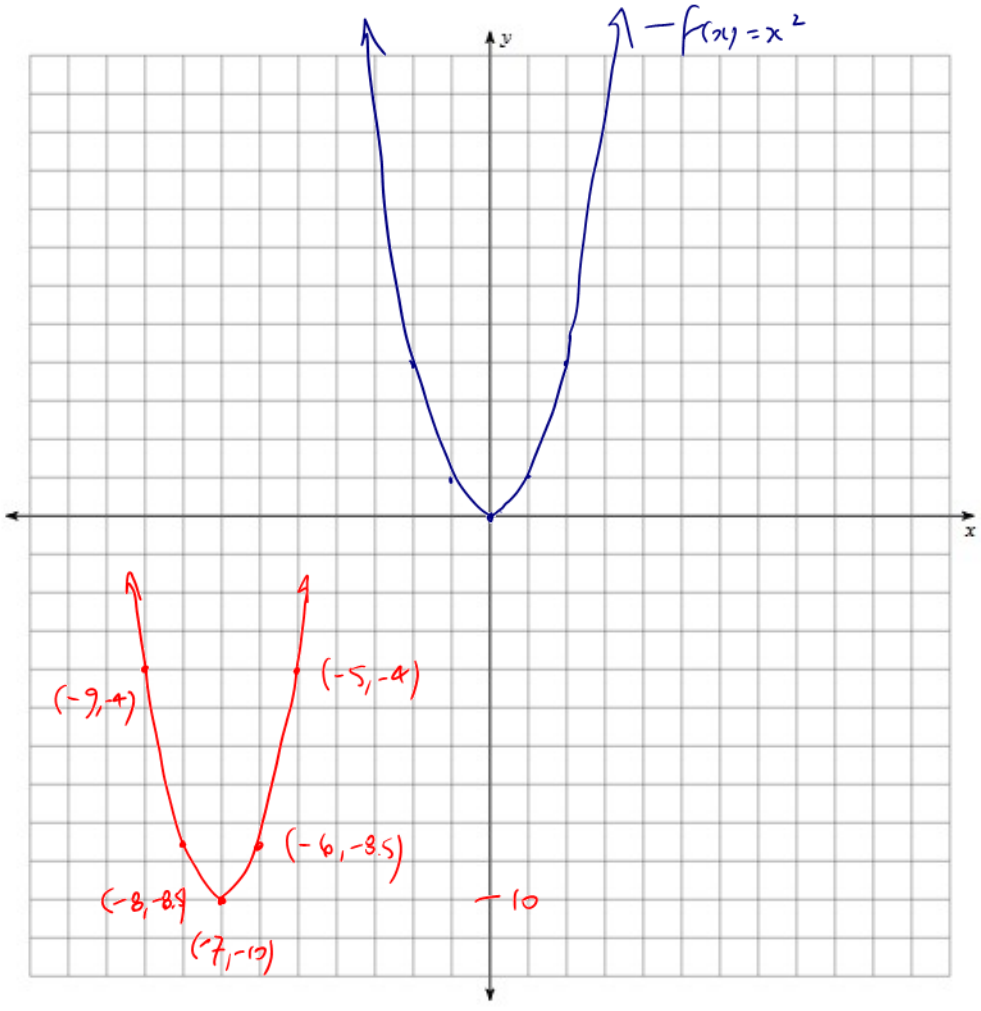
Function	Proper Function $f(x) = a\,f\left(k(x-d)\right)+c$	Vertical Stretch ***a***	Horizontal Stretch ***1/k***	Horizontal Shift ***d***	Vertical Shift ***c***
$u(x) = \frac{3}{2}(x+7)^2 - 10$	$u(x) = \frac{3}{2}(x+7)^2 - 10$	$\frac{3}{2}$	1	7 left	10 down

Domain	$\{x \in \mathbb{R}\}$	Range	$\{u(x) \in \mathbb{R} \mid u(x) \geq -10\}$	y-int (x=0)	63.5

Table Of Values

Parent Function: $f(x) = x^2$		Transformed Function	
x_p	f	$x_t = x_p - 7$	$u = \frac{3}{2}f - 10$
-2	4	-9	-4
-1	1	-8	-8.5
0	0	-7	-10
1	1	-6	-8.5
2	4	-5	-4

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**
$w(x)=\frac{-3}{4}\sqrt{\frac{-5}{2}x+10}+12$	$w(x)=-\frac{3}{4}\sqrt{-\frac{5}{2}(x-4)}+12$	$-\frac{3}{4}$	$-\frac{2}{5}$	4 right	12 up

Domain	$\{x\in\mathbb{R} \mid x\le 4\}$	Range	$\{w(x)\in\mathbb{R} \mid w(x)\le 12\}$	y-int (x=0)	

	Parent Function: $f(x)=\sqrt{x}$		Transformed Function	
	x_p	f	$x_t=-\frac{2}{5}x_p+4$	$w=-\frac{3}{4}f+12$
Table Of Values	0	0	4	12
	1	1	3.6	11.25
	4	2	2.4	10.5
	9	3	0.4	9.75

Graph both the parent function and the transformed function.