Unit 2 Review: Functions

Topics:

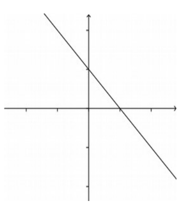
- How do we write relations?
- What is a function?
- Function Notation
- Domain and Range
- Inverses of relations
- The Parent Square Root Function: key features like domain, range, general shape, transformations
- The Parent Reciprocal Function (Hyperbola): features like domain, range, general shape, transformations
- Transformations: describe them, write them in function notation, $y = a\,f\left[k\left(x-p\right)\right]+q$, apply them to any given relation
- Identify the transformations given a graph.

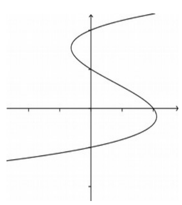
Questions to work on from the text:
Pg. 246 #1 – 6, 9 – 45.

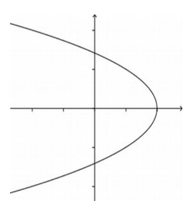
Supplementary problems
(These are sample questions for each topic; look at the textbook questions as well!):

1. Write the relation defined by $y=5x^2+8$ in four different ways (table of values, description of transformations, function notation, graph, etc.).

2. Which of the graphs shown below are **not** functions of *x*? Justify your answer.


a)


b)


c)

x	y
-5	4
-5	6
-3	6
0	0
0	2
2	0
3	9

(d)

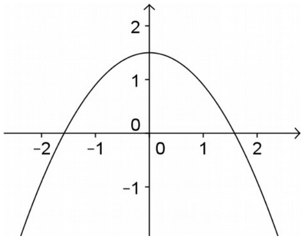
3. For $f(x)=2x^2-3x+5$, find

   a) $f(-2)$ b) $f\left(\frac{1}{3}\right)$ c) $f(0)$ d) $f(2x)$ e) $f(x-1)$ f) *a* when $f(a)=4$

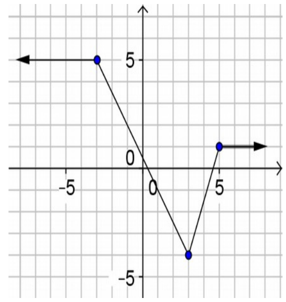
4. State the domain and range of each relation.

   (a) $M=\{(2,3),(-5,½),(\frac{1}{3},4),(7,-3),(5,-2),(\frac{1}{4},6)\}$ (b) $y=2\sqrt{-(x+3)}$

   (c)



   (d)

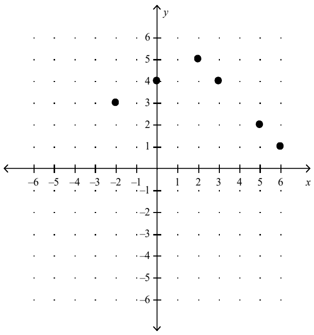


5. State the domain, range and intercepts of the parent function, $f(x)=\sqrt{x}$

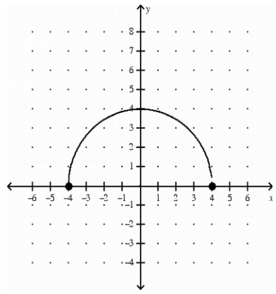
6. Sketch the function $f(x)=\frac{1}{x}$. List two key features of the function reciprocal function that are unique to this function and label them on the graph.

7. Determine the inverse for each of the relations given below. State if the original relation is a function and state if the inverse is a function.

a)



b)



c) $2x+3y=6$

d) $y=\sqrt{x+3}$

e) $y=\dfrac{1}{x+3}$

f) $\{(1,2),(-3,5),(10,-4)\}$

8. Describe the transformations $y=f(-x)$ has undergone in each of the following cases. Write the transformations in function notation, if it is not provided.

(a) $y=f(x)-1$, $y=f(x+4)$

(b) $y=f(4x)$, $y=f(x)+3$

(c) $y=2f(x+1)$, $y=-f(x-3)+2$

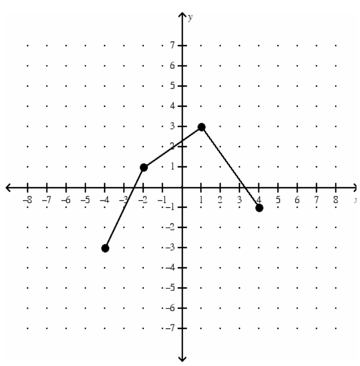
(d) $\sqrt{x}$, $\dfrac{1}{x}$

(e) $f\left(\dfrac{x}{2}\right)$, 

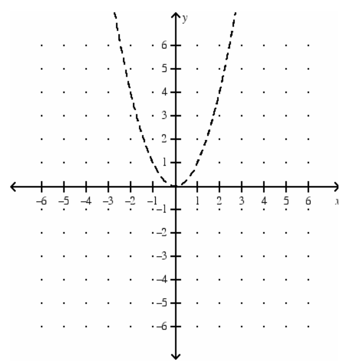
(f) $f(x)$

9. The graph of $-\sqrt{2x+10}$ is shown below. On the same set of axes, graph the desired transformations.

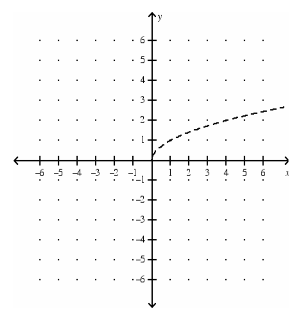
a) $\{x\in\mathbb{R}|x\neq-4\}$ and $y=f(-x)$



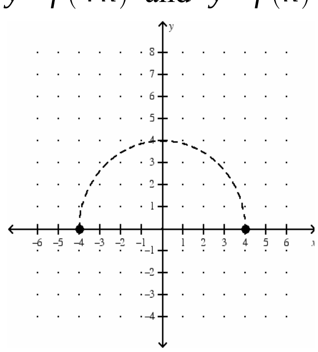
b) $y=f(x)-1$



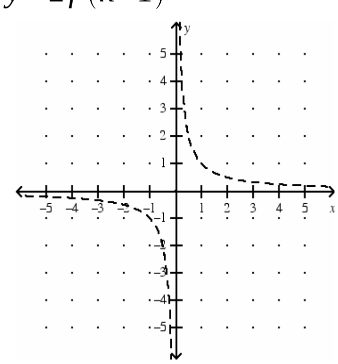
c) $y=f(x+4)$



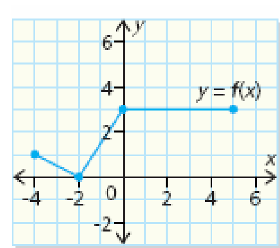
d) $y=f(4x)$ and $y=f(x)+3$



e) $y=2f(x+1)$



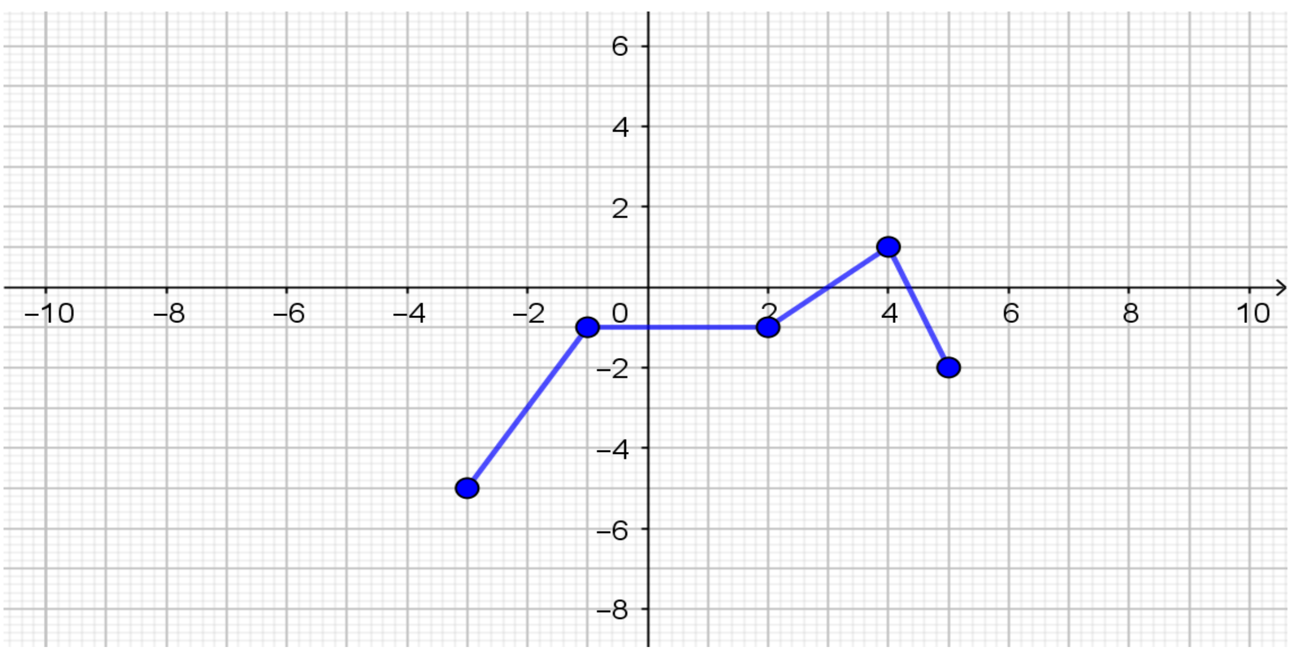
f) $y=-f(x-3)+2$

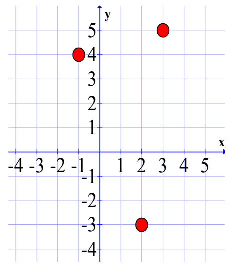


10. Fill in the table. Simplify the functions $f(x) = x$ and $f(x) = x^2$ so that they are in the form $\{y \in \mathbb{R} | y \neq 3\}$ and $y = \frac{1}{x}$.

$f(x)$	x	$y=-(x+1)^2$	$\sqrt{x}$	$\frac{1}{x}$
$-3f(x)$				
$f(x)+4$				
$f(x-3)$				
$f(-x)$				
$f\left(\frac{x}{2}\right)$				
$f(0.5(x-1))$				
$5f(x-1)+2$				
		$-2(x+3)^2-5$		
				$\frac{1}{x-4}+1$
			$-\sqrt{2x+10}$	

11. The function $f(x)$ is shown on the grid below. Graph $y=-0.5f[-(x+4)]-1$.



Graph			
Function type	Relation – ordered pairs		
Domain			$\{x \in \mathbb{R} \mid x \neq -4\}$
Range			$\{y \in \mathbb{R} \mid y \neq 3\}$
Key features (asymptotes, behaviour, period, etc.)			
y-int.			
x-int.			
Parent function			$y = \frac{1}{x}$
Transformations (if any)	Horizontal compression by a factor of 2; Vertical shift up 1 unit		
Function notation			
Equation of the function		$y = -(x+1)^2$	
Graph of the inverse			
Equation of the inverse			