Name: Claire Li Date: Sep 8.

Math 10 Enriched: Section 1.1 Introduction to Function Notat

1. Given the functions, $f(x)=3x^2-2x$ and $g(x)=-\frac{3x}{2}+3$, find the indicated values:

i) $f(3)\times g(4)$

$=(3\cdot3^2-6)(-\frac{3\cdot4^2}{2}+3)$

$=21\cdot(-3)$

$=-63$

ii) $2f(-2)-3g(2)$

$=2(12+4)-3(-3x+6)$

$=32+9x-18$

$=14+9x$

iii) $4f(2)\times g(-3)$

$=4(3\cdot4-4)\times(\frac{9}{2}+3)$

$=32\times\frac{15}{2}$

$=240$

2. Given the functions, $f(x)=\sqrt{x}+3$ and $g(x)=2x^2-1$, find the indicated values:

i) $f(g(x))$

$=f(2x^2-1)$

$=\sqrt{2x^2-1}+3$

ii) $g(f(x))$

$=g(\sqrt{x}+3)$

$=2(x+9+6\sqrt{x})-1$

$=2x+17+12\sqrt{x}$

iii) $8f(x)+2g(x)$

$=8(\sqrt{x}+3)+2(2x^2-1)$

$=8\sqrt{x}+24+4x^2-2$

$=4x^2+8\sqrt{x}+22$

iv) $9g(x)-2f(x)$

$=9(2x^2-1)-2(\sqrt{x}+3)$

$=18x^2-9-2\sqrt{x}-6$

$=18x^2-2\sqrt{x}-15$

v) $g(f(18))$

$=g(\sqrt{18}+3)$

$=2(\sqrt{18}+3)^2-1$

$=2(18+9+18\sqrt{2}$

vi) $(f(g(5)))$

$=f(2x^2-1)$

$=\sqrt{2x^2-1}+3$

vii) $f(f(x))$

$=f(\sqrt{x}+3)$

$=\sqrt{\sqrt{x}+3}+3$

viii) $g(g(f(25)))$

$=g(g(8))$

$=g(127)$

$=16128$

ix) $f(g(f(50)))$

$=f(g(5\sqrt{2}+3)$

$=f(2(50+9+30\sqrt{2})-1)$

$=f(118+60\sqrt{2}-1)$

$=f(117+60\sqrt{2})$

$=\sqrt{117+60\sqrt{2}}+3$

3. If $f(x)=x^2+3x-10$, find the value of "x" that will make the expression true:

i) $f(x)=0$

$x^2+3x-10=0$

$(x+5)(x-2)=0$

$x=2$

v) $f(x)=8$

$\sqrt{x}+3=8$

$\sqrt{x}=5$

$x=25$

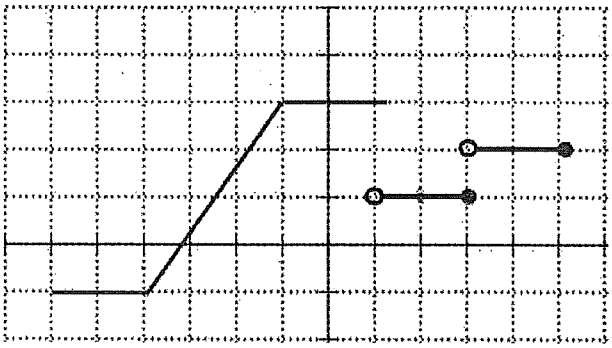
vi) $f(x)=-6$

$\sqrt{x}+3=-6$

$\sqrt{x}=-9$

N/A

4. Given the graph of $f(x)$, find the indicated values:



i) $f(2)=1$ *ii)* $f(1)=3$.

iii) $f(4)=2$. *v)* $f(?)=3$

$-1\le ?\le 1$.

vi) $f(-4)\times f(3)$

$=-1\times 1$

$=-1$.

5. If $f(x)=x^2-x+2$, $g(x)=ax+b$, and $f(g(x))=9x^2-3x+2$, determine all possible ordered pairs (a,b) which satisfy this relationship.

$f(ax+b)=9x^2-3x+2$

$(ax+b)^2-ax-b+2=9x^2-3x+2$

$a^2x^2+b^2+2abx-ax-b+2=9x^2+3x+2$.

$\begin{cases} a^2=9 \rightarrow a=3 \\ 2ab-a=3 \rightarrow 2ab=b \\ b^2-b+2=2 \end{cases}$

$a=-3$.

$-6b=0$

$b=0$

$b=1$.

$\begin{cases} a=3 \\ b=1 \end{cases}$ $\begin{cases} a=-3 \\ b=0 \end{cases}$

6. If $f(x)=2x-1$, determine all real values of "x" such that $(f(x))^2-3f(x)+2=0$

$(2x-1)^2-6x+3+2=0$

$4x^2-4x+1-6x+5=0$

$4x^2-10x+6=0$

$2x^2-5x+3=0$

7. A function $f(x)$ has the following three properties:

i) $f(1)=1$, ii) $f(2x)=4f(x)+6$, iii) $f(x+2)=f(x)+12x+12$

Calculate the value of $f(6)$. $x=3$.

$f(6)=4f(3)+6$

$=4(f(1)+12+12)+6$

$=106$

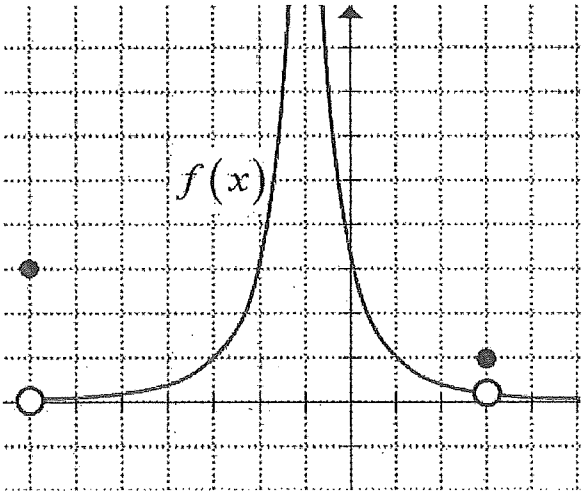
8. Give an example of a function $g(x)$ such that the identity below is true for all values of "x" and "y"

$g(x+y)=g(x)+g(y)$

$g(x)=x$

$x+y=x+y$. ✓

9. Given the graph of $f(x)$, find the value of the following values:



i) $f(f(3))=$ 1
$f(3)=1$.

ii) $f(f(0))=$ 1
$f(0)=3$.

iii) $f(-1)$
N/A

v) $f(-7)\times f(0)$
$=0\times 3$
$=0$.

vi) $f(f(x))=x \quad x=?$
$f(1)=1$. $x=1$.

vi) $f(f(f(-2)))$
$=f(f(3))$
$=f(1)$
$=1$

10. Let $f(x)=2^{kx}+9$, where "k" is a real number. If $f(3):f(6)=1:3$, determine the value of $f(9)-f(3)$.

$\frac{f(3)}{f(6)}=\frac{1}{3}$

$\frac{2^{3k}+9}{2^{6k}+9}=\frac{1}{3}$

$3\cdot 2^{3k}+27=2^{6k}+9$

$2^{6k}-3\cdot 2^{3k}=18$

$2^{3k}(2^{3k}-3)=18$

$A=2^{3k}$

$A^2-3A-18=0$.

$A\times -6$
$A\quad 3$. $A=6$ or -3

$f(9)-f(3)$
$=2^{9x}+9-2^{3x}+9$
$=(2^{3x})^3-2^{3x}$
$=216+6$ or $=-27+3$.
$=222$ $=24$.

11. The function $f(x)$ has the property that $f(2x+3)=2f(x)+3$ for all values of "x". If $f(0)=6$, what is the value of $f(9)$?

$f(3)=2\cdot 6+3$.
$f(3)=15$.

$f(2x+3)=2f(x)+3$
$f(9)=33$

12. Given the piece-wise function, what is the value of $f(f(f(3)))$?

$$f(n)=\begin{cases} n^2 & \text{if } n \text{ is even} \\ n+1 & \text{if } n \text{ is odd} \end{cases}$$

$=f(f(4))$
$=f(16)$.
$=256$

13. The function "f" is defined for integer values only and satisfies the following, what is the value of $f(20)$?

$$f(n)=\begin{cases} n+2 & \text{if } n<10 \\ f(n-2) & \text{if } n\geq 10 \end{cases}$$

$f(20)=f(18)$
$=f(16)$
$=f(8)$
$=10$

14. Let $\phi(x)$ denote the sum of the digits of the positive integer "x". For example, $\phi(8)=8$ and $\phi(123)=1+2+3$. For how many two digit value of "x" is $\phi(\phi(x))=3$?

a) 3 b) 4 c) 6 d) 9 e) 10

$X=\overline{ab}$.

$\phi(\phi(x))=\phi(a+b)=3$.

$(a,b)=(3,0),(2,1),(1,2)$

15. For any three real numbers "a", "b", and "c", with $b\neq c$, the operation ϖ is defined by:

$\varpi(a,b,c)=\dfrac{a}{b-c}$. What is the value of $\varpi(\varpi(1,2,3),\varpi(2,3,1),\varpi(3,1,2))$?

$=\varpi\left(\frac{1}{2-3},\frac{2}{3-1},\frac{3}{1-2}\right)$

$=\varpi(-1,1,-3)$

$=\frac{-1}{1+3}=\boxed{\frac{1}{4}}$

16. COMC: Let $f(x)=x^2$ and $g(x)=3x-8$,

a. Determine all values of "x" such that $f(g(x))=g(f(x))$

$f(3x-8)=g(x^2)$

$9x^2-48x+64=3x^2-8$

$6x^2-48x+72=0$

$x^2-8x+12=0$

$(x-2)(x-6)=0$

$x=\boxed{2 \text{ or } 6}$

b. Let $h(x)=3x-r$, determine all values of "r" such that $f(h(2))=h(f(2))$

$f(6-r)=h(4)$

$r^2-12r+36=12-r$

$r^2-11r+24=0$

$(r-3)(r-8)=0$

$r=\boxed{3 \text{ or } 8}$

17. Challenge: Let $f(t)=\dfrac{7^t}{7^t+\sqrt{7}}$. Find the value of the following:

$f\left(\frac{1}{2014}\right)+f\left(\frac{2}{2014}\right)+f\left(\frac{3}{2014}\right)+\ldots..+f\left(\frac{2013}{2014}\right)$

Let $\frac{1}{2014}=A$, $\frac{2013}{2014}=1-A$.

$f(A)=\frac{7^t}{7^t+\sqrt{7}}$ $f(1-A)=\frac{7^{1-t}}{7^{1-t}+\sqrt{7}}$

$=\frac{7^t}{7^t+\sqrt{7}}+\frac{7}{7+\sqrt{7}(7^t)}$ $=\frac{7}{7^t+\sqrt{7}}$

$=\frac{\sqrt{7}\cdot 7^t+7}{(\sqrt{7})7^t+7}=1$ $=\frac{7}{7+\sqrt{7}(7^t)}$.

$=1+1+\ldots+1$.

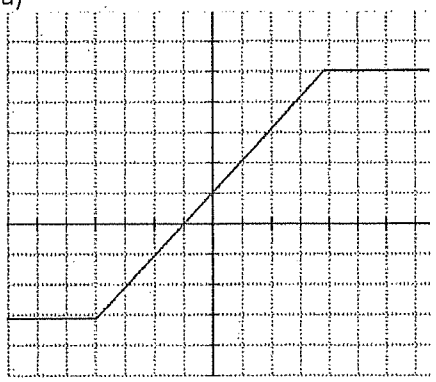
$=1007$.

Name: Claire Li Date: Sep. 8

Math 10 honors: Assignment 1.2 Introduction to Domain and Range

1. Given each of the following graphs, indicate the domain and range:

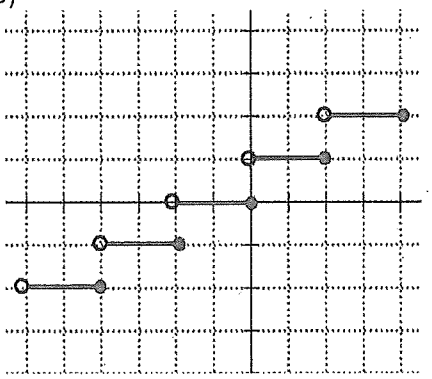
a)



Domain: $x \in R$

Range: $-3 \le y \le 5$

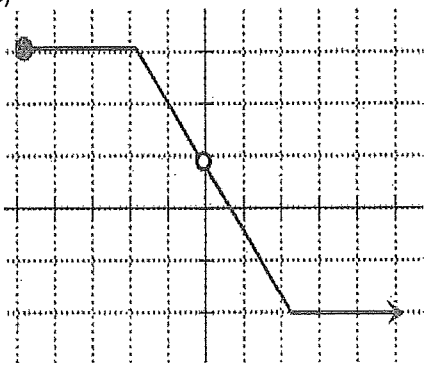
b)



Domain: $-4 < x \le 4$

Range: $-2 \le y \le 2$

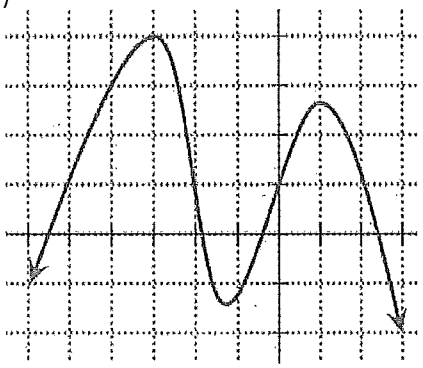
c)



Domain: $-5 \le x < 0$ or $0 < x \le 5$

Range: $-2 \le y \le 3$

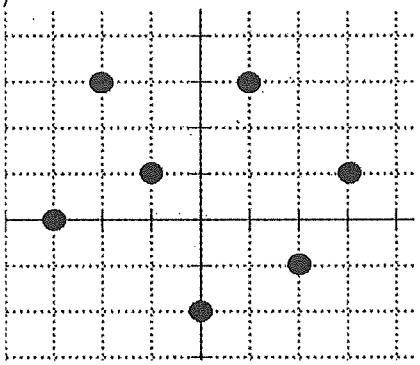
d)



Domain: $x \in R$

Range: $-2 \le y \le 4$

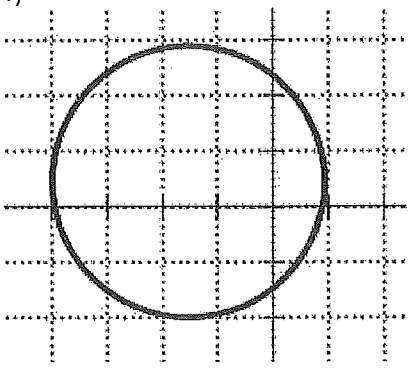
e)



Domain: $x \in \{-3, -2, -1, 0, 1, 2, 3\}$

Range: $y \in \{-2, -1, 0, 1, 3\}$

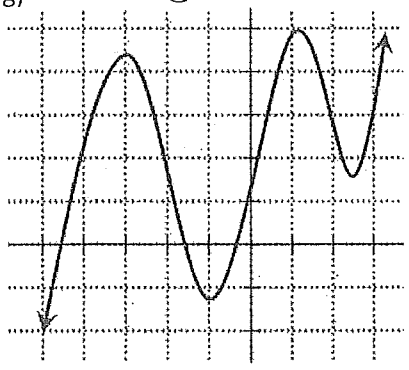
f)



Domain: $-4 \le x \le 1$

Range: $-2 \le y \le 3$

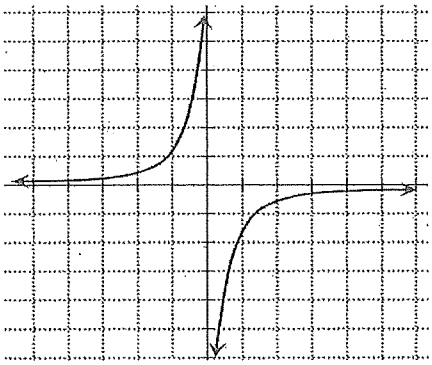
g)



Domain: $x \in R$

Range: $-2 \le y \le 5$

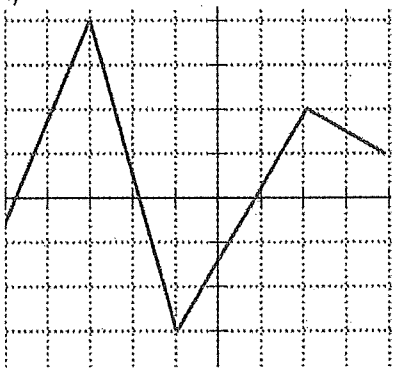
h)



Domain: $x \in R$

Range: $y \in R$

i)

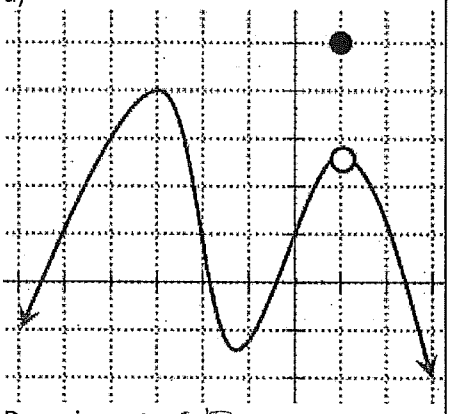


Domain: $x \in R$

Range: $-3 \le y \le 4$

2. Indicate the domain and range for each of the following graphs:

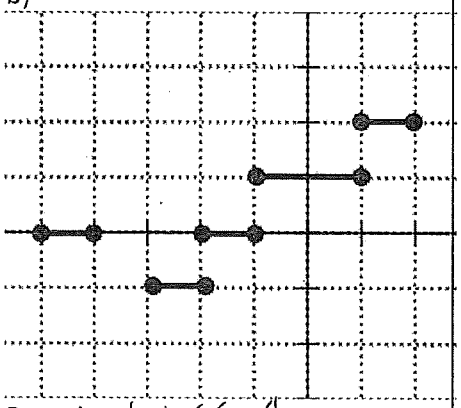
a)



Domain: $x \in \mathbb{R}$

Range: $-2 \leq y \leq 4$ or $y = 5$

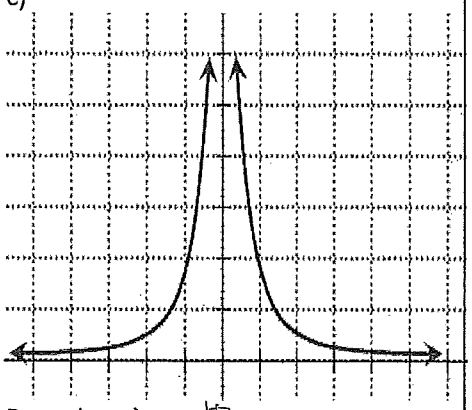
b)



Domain: $-5 \leq x \leq -4$ or $-3 \leq x \leq 2$

Range: $y \in \{-1, 0, 1, 2\}$

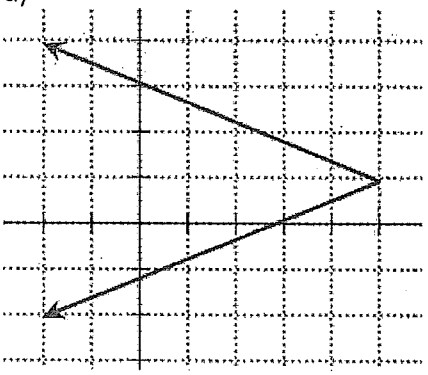
c)



Domain: $x \in \mathbb{R}$

Range: $y \geq 0$

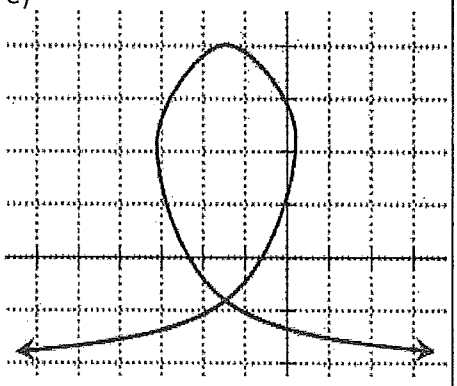
d)



Domain: $x \leq 5$

Range: $y \in \mathbb{R}$

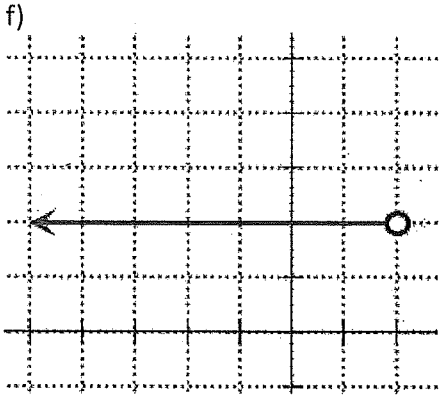
e)



Domain: $x \in \mathbb{R}$

Range: $y \leq 4$

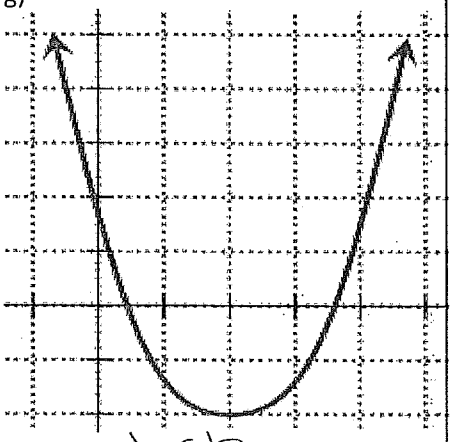
f)



Domain: $x < 2$

Range: $y = 2$

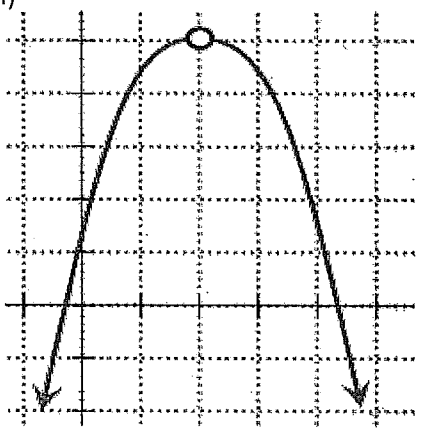
g)



Domain: $x \in \mathbb{R}$

Range: $y \geq -2$

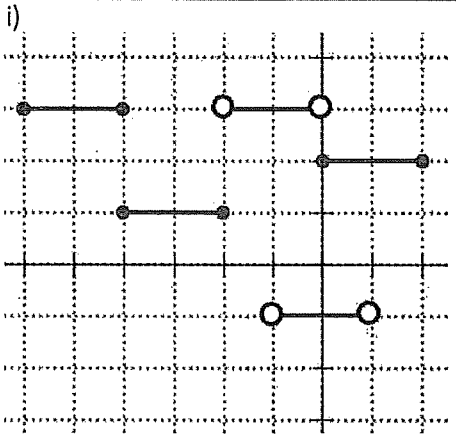
h)



Domain: $x \neq 2$ or $x > 2$

Range: $y < 5$

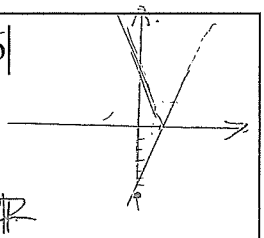
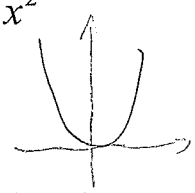
i)



Domain: $-6 \leq x \leq 2$

Range: $y \in \{-1, 1, 2, 3\}$

3. Indicate the domain and range for each of the following equations. Draw a quick sketch of the graph with the space provided if necessary:

a) $y=-2x+4$ Domain: $x\in\mathbb{R}$ Range: $y\in\mathbb{R}$	b) $2y+3=4$ $2y=1$ $y=\frac{1}{2}$ Domain: N/A. Range: $y=\frac{1}{2}$	c) $y=\lvert 3x-6\rvert$  Domain: $x\in\mathbb{R}$ Range: $y\geq 0$
d) $y=x^2$  Domain: $x\in\mathbb{R}$ Range: $y\geq 0$	e) $y=-x^2-3$ Domain: $x\in\mathbb{R}$ Range: $y\leq -3$	f) $y=x^2-7$ Domain: $x\in\mathbb{R}$ Range: $y\geq -7$
g) $y=\sqrt{x-3}$ Domain: $x\geq 3$ Range: $y\geq 0$	h) $y=-\sqrt{x+2}$ Domain: $x\geq -2$ Range: $y\leq 0$	i) $y=-\sqrt{-x+5}$ Domain: $x\leq 5$ Range: $y\leq 0$
j) $y=\sqrt{10-3x}+4$ Domain: $x\leq \frac{10}{3}$ Range: $y\geq 4$	k) $y=9-\sqrt{8x-12}$ Domain: $x\geq \frac{3}{2}$ Range: $y\leq 9$	l) $y=-x^2+100$ Domain: $x\in\mathbb{R}$ Range: $y\leq 100$
j) $y=\lfloor x\rfloor$ Domain: $x\in\mathbb{R}$ Range:	k) $9=x^2+y^2$ Domain: Range:	l) $x=-y^2+8$ $y^2=-x+8$ Domain: Range:

4. Given that $g(x)$ is a linear function such that $g(x)=6$, what is the domain and range of the function?

D: $x\in\mathbb{R}$

R: $y=6$.

5. Jacky went to Tim Hortons to buy donuts. They costs $0.55 per donut. If "x" is the number of donuts purchased and "y" is the total costs, what is the domain of "x" and the range of "y"?

$y = 0.55x$ $D: x \geq 0$

$R: y \geq 0$

6. Susan took a taxi to go home. The cost "C" of the taxi was 1.75 per km and a fixed cost of $5.00. What is the domain range of this scenario?

km = x

$y = 1.75x + 5$ $D: x \geq 0$

$R: y \geq 5$

7. The fuel efficiency of a Toyota Camry is about 700km per 70L of gasoline. If "D" is the number of kilometers driven and "L" is the Litres of gasoline required, what is the domain and range of this scenario?

$\frac{D}{700} = \frac{L}{70}$

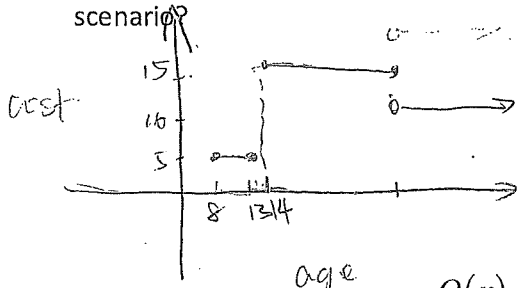
$70D = 700L$

$D = 10L$

$D: x \geq 0$

$R: y \geq 0$

8. Janet is going to the PNE fair. Tickets costs $5 for kids between ages 8 to 13, $15 for ages between 14 to 65, $12 for seniors above 65 years of age, and kids under 7 are for free. What is the domain and range of this scenario?



$D: 8 \leq x \leq 13 \text{ or } 14 \leq x$

$R: y \in \{0, 5, 12, 15\}$

9. Given the function $f(x) = \frac{Q(x)}{x^2 + 3 - k}$, where $Q(x)$ is a linear function. For what values of "k" will the domain of $f(x)$ be all real numbers?

$x^2 + 3 - k \neq 0$

$3 - k \neq 0$

$3 > k$

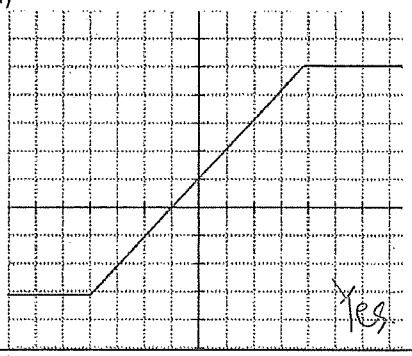
$\therefore k < 3$

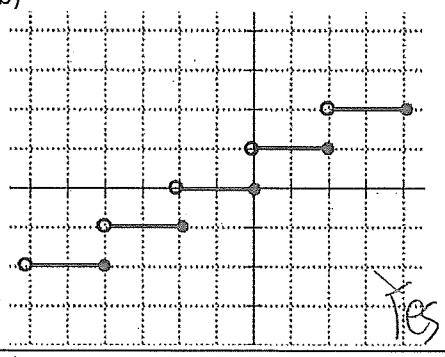
10. Suppose $h(x) = \frac{f(x)}{g(x)}$, will the domain of $h(x)$ be the same as either i) $f(x)$ ii) $g(x)$ or iii) $\frac{f(x)}{g(x)}$?

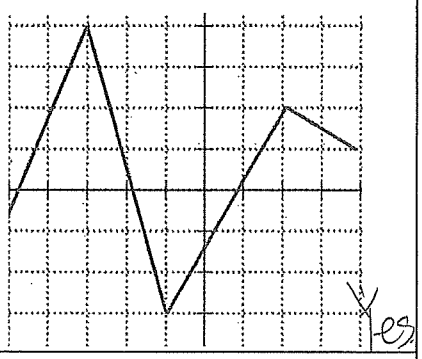
Name: Claire Date: Sep 13

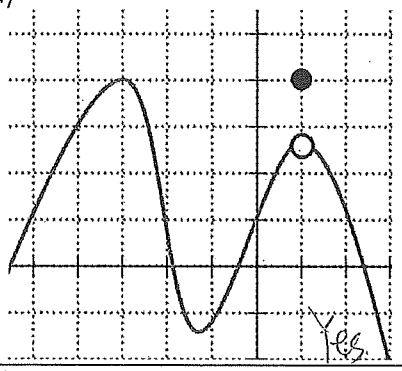
Math 10 Enriched: HW 1.3 Introduction to Complex Functions and Transformation Functions

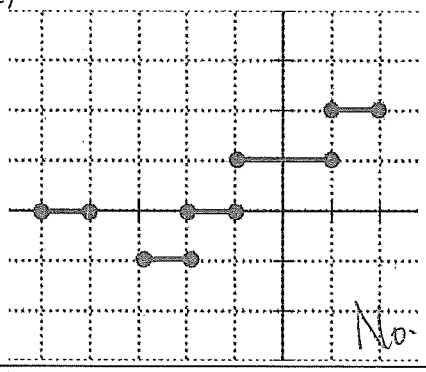
1. Indicate which of the following graphs are functions. YES or No? Explain

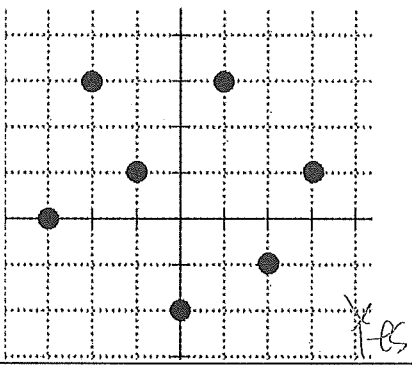
a) 

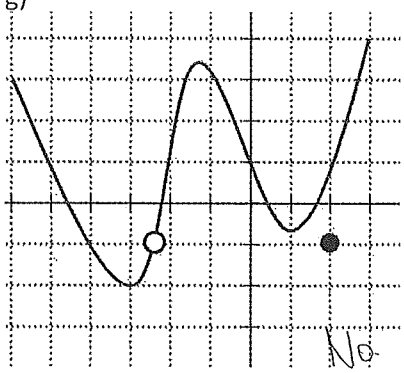
b) 

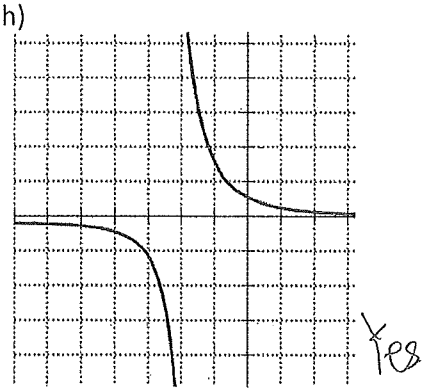
c) 

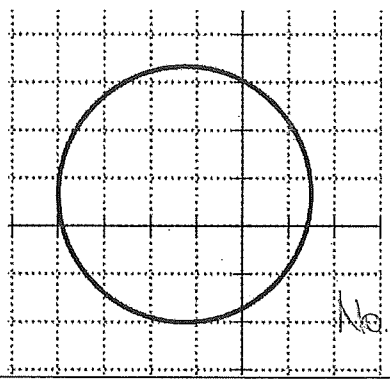
d) 

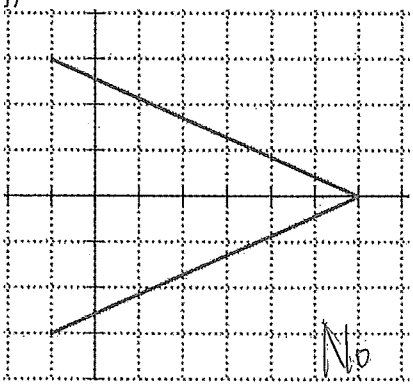
e) 

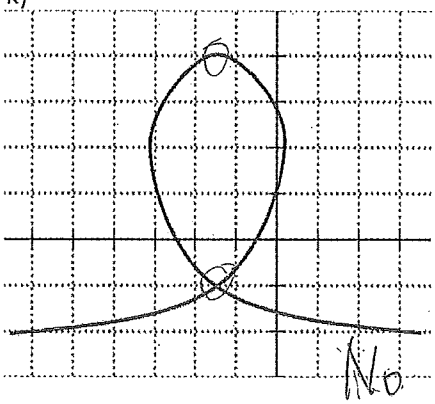
f) 

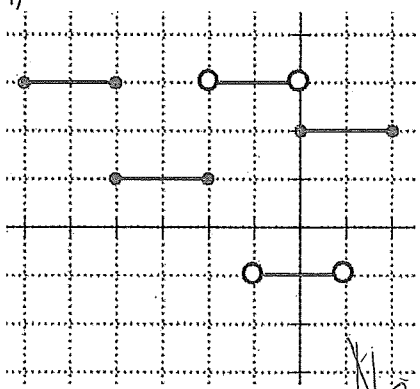
g) 

h) 

i) 

j) 

k) 

l) 

2. Solve each of the following inequalities:

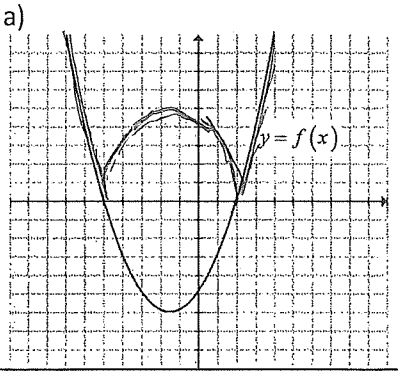
a) $x^2-25>0$ $x^2>25$ $x>5$ or $x<-5$	b) $3x^2-27<0$ $3x^2<27$ $x^2<9$ $x>3$ or $x<3$	c) $5x^2-20x>0$ $x(x-4)>0$ $x-4>0$ or $x-4<0, x<0$ $x>4$ $\therefore x>4$ or $x<0$
d) $x^2+5x+6\le 0$ $(x+1)(x+5)\le 0$ $x+1\le 0$ or $x+5\le 0$ $x\le -1$ $x\le -5$ $\therefore x\le -1$	e) $6x^2+x-12\ge 0$ $(2x+3)(3x-4)\ge 0$ $2x+3\ge 0$ or $3x-4\ge 0$ $2x\ge -3$ $3x\ge 4$ $x\ge -\frac{3}{2}$ $x\ge \frac{4}{3}$ $\therefore x\ge -\frac{3}{2}$ //	f) $4x^2+1\le 0$ $4x^2\le -1$ $x^2\le -\frac{1}{4}$ N/A.

3. Indicate the domain and range for each of the following equations. Draw a quick sketch of the graph with the space provided if necessary. Use Desmos is necessary:

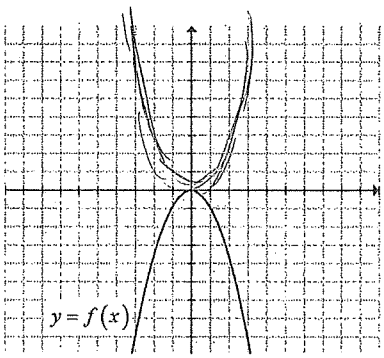
a) $y=\sqrt{x^2-4}$ $x^2-4\ge 0$ $x^2\ge 4$ $x\ge 2$ or $x\le -2$ Domain: $x\ge 2$ or $x\le -2$ Range: $y\ge 0$	b) $y=\sqrt{2x^2-9}$ $2x^2-9\ge 0$ $2x^2\ge 9$ $x^2\ge \frac{9}{2}$ $x\ge \frac{3\sqrt{2}}{2}$ $x\le -\frac{3\sqrt{2}}{2}$ Domain: $x\le -\frac{3\sqrt{2}}{2}$ or $x\ge \frac{3\sqrt{2}}{2}$ Range: $y\ge 0$	c) $y=\sqrt{25-x^2}$ $25-x^2\ge 0$ $x^2\le 25$ $-5\le x\le 5$ Domain: $-5\le x\le 5$ Range: $y\ge 0$
d) $y=\sqrt{24-3x^2}$ $24-3x^2\ge 0$ $x^2\le 8$ $-2\sqrt{2}\le x\le 2\sqrt{2}$ Domain: $-2\sqrt{2}\le x\le 2\sqrt{2}$ Range: $y\ge 0$	e) $y=\sqrt{-x^2-3}$ $-x^2-3\ge 0$ $x^2\le -3$ No solution Domain: Range:	f) $y=-\lvert x^2-7\rvert+3$ Domain: $x\in\mathbb{R}$ Range: $y\le 3$.
g) $y=\lvert x^2-3\rvert-2$ Domain: $x\in\mathbb{R}$ Range: $y\ge -2$	h) $y=\frac{1}{3x^2-12}$ $3x^2-12\ne 0$ $x^2\ne 4$ $x\ne \pm 2$ Domain: $x\in\mathbb{R}$, $x\ne \pm 2$ Range: $y\in\mathbb{R}$	i) $y=\frac{2x-3}{x-4}$ Domain: $x\in\mathbb{R}$, $x\ne 4$ Range: $y\in\mathbb{R}$,
j) $y=\lvert x^2-4\rvert$ Domain: $x\in\mathbb{R}$ Range: $y\ge 0$	k) $y=\frac{3x^2}{x^2-3}$ $x^2-3\ne 0$ $x^2\ne 3$ Domain: $x\in\mathbb{R}$, $x\ne \pm\sqrt{3}$ Range: $y\in\mathbb{R}$, ?	l) $y=\frac{2x-8}{x^2-16}$ $x^2-16\ne 0$ $x^2\ne 16$ $x\ne \pm 4$. Domain: $x\in\mathbb{R}$, $x\ne \pm 4$. Range: $y\in\mathbb{R}$

4. Graph $y=|f(x)|$ for each function on the same grid:

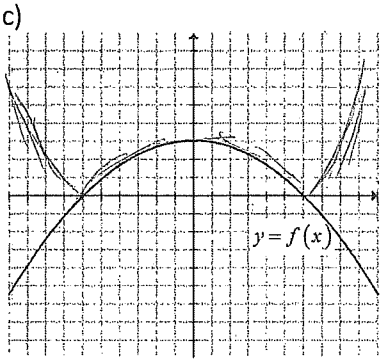
a)



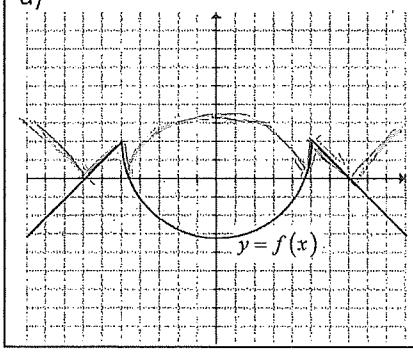
b)



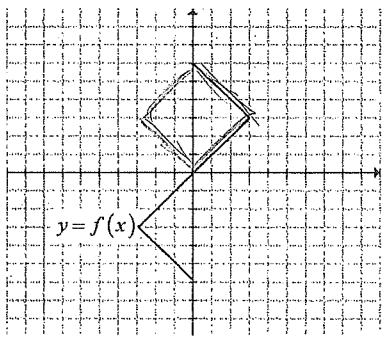
c)



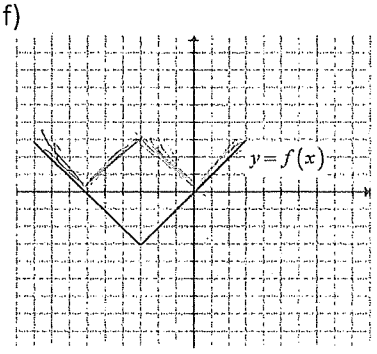
d)



e)



f)



5. Given the following functions $y=f(x)$, find the equation of $y=f^{-1}(x)$

a) $y=\dfrac{x+3}{x-7}$

$x=\dfrac{y+3}{y-7}$

$xy-7x=y+3$

$xy-y=7x+3$

$y(x-1)=7x+3$

$y=\dfrac{7x+3}{x-1}$

b) $y=\dfrac{3x-11}{8x+12}$

$x=\dfrac{3y-11}{8y+12}$

$8xy+12x=3y-11$

$8xy-3y=-12x-11$

$y(8x-3)=-12x-11$

$y=\dfrac{12x+11}{3-8x}$

6. Given the table of values for $y=f(x)$, find the following values:

x	$f(x)$
–3	–2
–2	–12
–1	5
0	11
1	13
2	15
3	0
4	–3

i) $|f(0)|$ $=11$

ii) $f^{-1}(-2)$ $=-3$

iii) $f^{-1}(5)$ $=-1$

iv) $|f(2)|$ $=15$

v) $|f(-2)|$ $=12$

vi) $|f(4)|$ $=3$

vii) $f^{-1}(-3)$ $=4$

viii) $|f^{-1}(-3)|$ $=4$

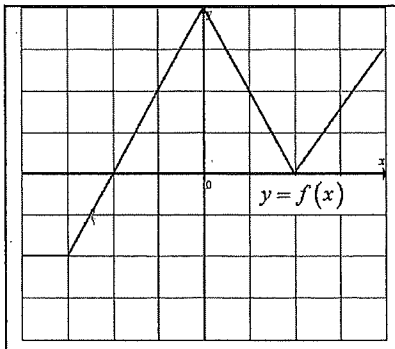
ix) $|f^{-1}(-12)|$ $=2$

x) $f^{-1}(f(4))$ $=f^{-1}(-3)$ $=4$

xi) $f^{-1}(f(x))$ $=x$

xii) $f(f^{-1}(x))$ $=x$

7. Given the graph of $y=f(x)$, find the following values:



a) $f(2)$ $=0$	b) $f(-3)$ $=-2$.	c) $\lvert f(-3.2)\rvert$ $=2$
d) $\lvert f(4)\rvert$ $=3$	e) $f^{-1}(-1)$ $=-2\frac{1}{2}$. $=-2.5$	f) $f^{-1}(4)$ $=0$.
g) $f^{-1}(0)$ $=\pm 2$	h) $f^{-1}(-2)$ $=-3$	i) $\lvert f^{-1}(-2)\rvert$ $=3$.

8. Given the domain and range of $y=f(x)$, what is the domain and range of $y=f^{-1}(x)$

$y=f(x)$

$D:-3\le x\le 8 \quad R:y\ge 9$

$y=f^{-1}(x)$

$D: x\ge 9$

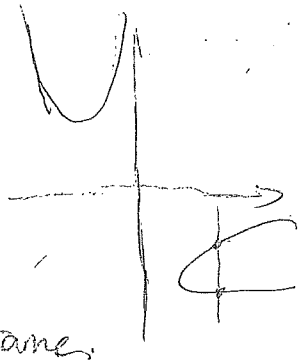
$R: -3\le y\le 8$

9. Given that $y=x^2+6x+20$, find $y=f^{-1}(x)$ and also get the domain and range.

$y=(x+6x+9)^2+11 \qquad x=(y+3)^2+11$

$y=(x+3)^2+11 \rightarrow \pm\sqrt{x-11}=y$

$y=-3\pm\sqrt{x-11}$ ↙ Not a function!



10. What are some functions where the domain and range of $f(x)$ and $f^{-1}(x)$ the same?

↳ the domain and range of $f(x)$ is the same.

$y=x$ $\quad y=2x+6$ --- all the linear functions

11. If $f(x)=px+q$ and $f(f(f(x)))=8x+21$ and if "p" and "q" are real numbers, then what is $p+q$?

Fermat 1997

$f(f(px+q))=8x+21$

$f(p(px+q)+q)=8x+21$

$p(p(px+q)+q)+q=8x+21$

$p(p^2x+pq+q)+q=8x+21$

$p^3x+p^2q+pq+q=8x+21$

$\begin{cases} p^3=8 \\ p^3q+pq+q=21 \end{cases} \Rightarrow \begin{cases} p=2 \\ q=3 \end{cases}$

$4q+2q+q=21$

$7q=21$

$q=3$

$\therefore p+q=5$

12. The Function $f(x)$ has the property that $f(x+y)=f(x)+f(y)+2xy$, for all positive integers "x" and "y". If $f(1)=4$, then what is the value of $f(8)$? Fermat 2002

$f(2)=f(1)+f(1)+2$
$=4+4+2$
$=10$

$f(3)=f(1)+f(2)+4$
$=4+10+4$
$=18$

$f(5)=f(2)+f(3)+12$
$=10+18+12$
$=40$

$f(8)=f(5)+f(3)+30$
$=40+18+30$
$=\boxed{88}$

13. The polynomial $f(x)$ satisfies $f(x)-f(x-2)=(2x-1)^2$ for all "x". If "p" and "q" are the coefficients of x^2 and x, respectively, in $f(x)$, then what is the value of $p+q$? Fermat 2004

$f(\frac{1}{2})-f(-\frac{3}{2})=0$

$f(\frac{1}{2})=f(-\frac{3}{2})$

$(2x-1)^2=0$
$2x-1=0$
$x=\frac{1}{2}$

$px^2+qx+b-p(x-2)^2-q(x-2)-b=(2x-1)^2$

$px^2-p(x^2-4x+4)+qx-qx+2q$
$px^2-px^2+4px-4p+2q$
$4p(x-1)+2q=4x^2+4x+1$

$=4x^2-4x+1$
$=4x^2+4x+1$

$x=\frac{1}{2}$

$\frac{1}{2}(4p)+2q=1+2+1$
$2p+2q=4$
$p+q=\boxed{2}$