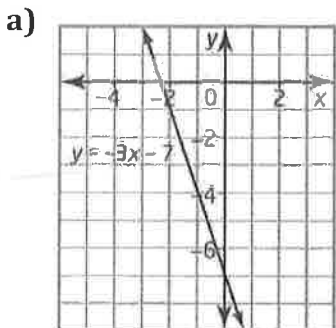


# 1.1 Functions, Domain, and Range - Worksheet

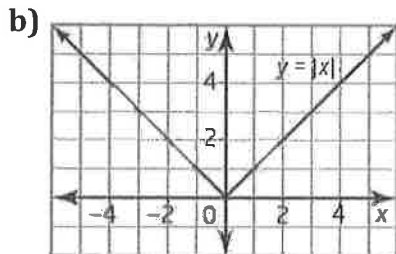
MCR3U  
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SOLUTIONS

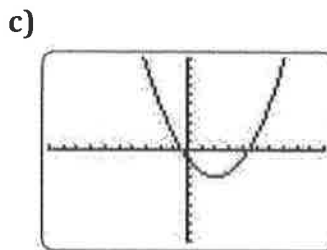
1) Which graphs represent functions? Justify your answer.



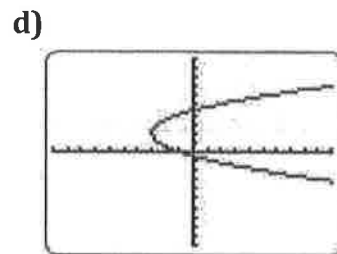
function



function



function



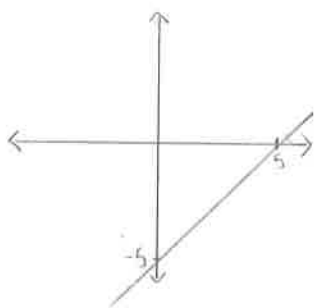
Not a function

- fails vertical line test.

2) Is each relation a function? Explain and make a rough sketch of the graph of each.

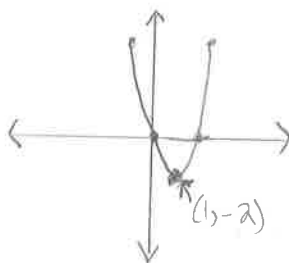
a)  $y = x - 5$

function



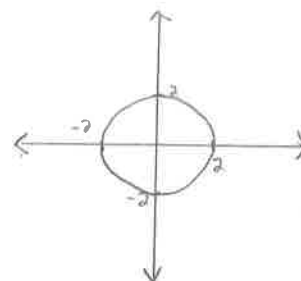
b)  $y = 2(x - 1)^2 - 2$

function



c)  $x^2 + y^2 = 4$

NOT a function



3) State the domain and range. Represent as a table and graph. Then state if it is a function.

a)  $\{(-5, 4), (-4, -1), (-2, 1), (0, 4), (1, 3)\}$

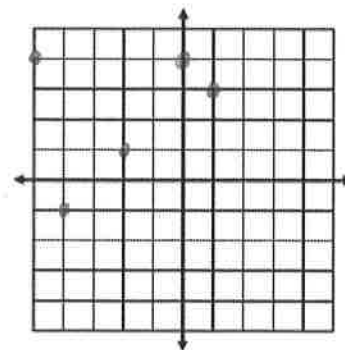
Domain:

$\{x = -5, -4, -2, 0, 1\}$

Range:

$\{y = -1, 1, 3, 4\}$

x	y
-5	4
-4	-1
-2	1
0	4
1	3



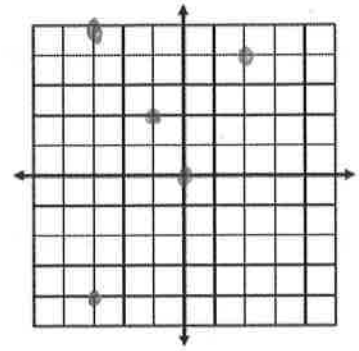
Is this relation a function? Yes

b)  $\{(-3, -4), (-1, 2), (0, 0), (-3, 5), (2, 4)\}$

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

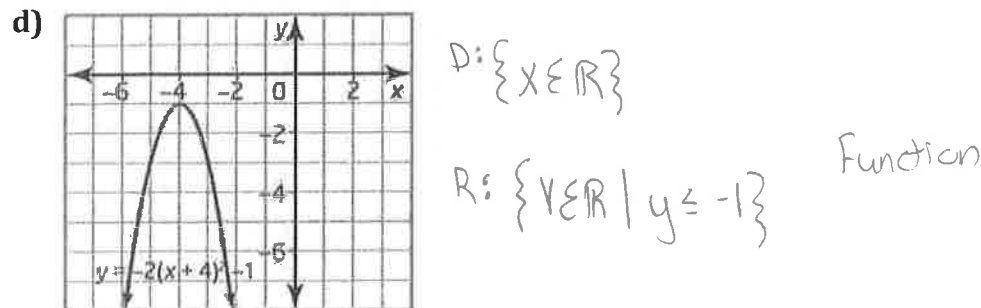
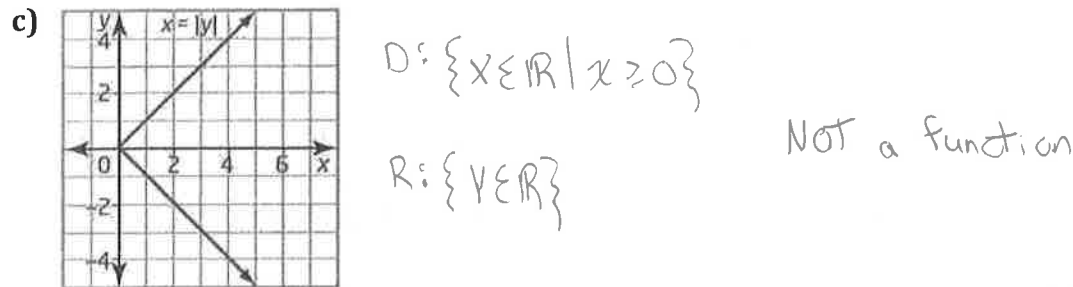
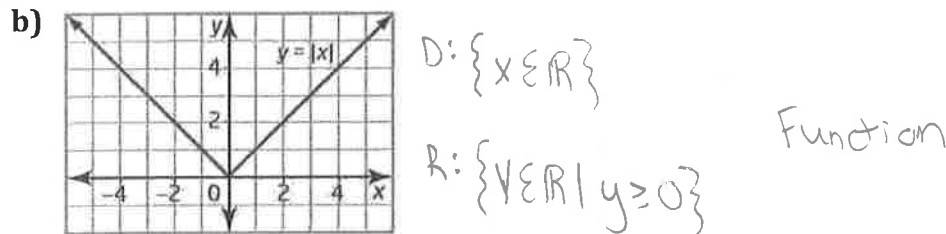
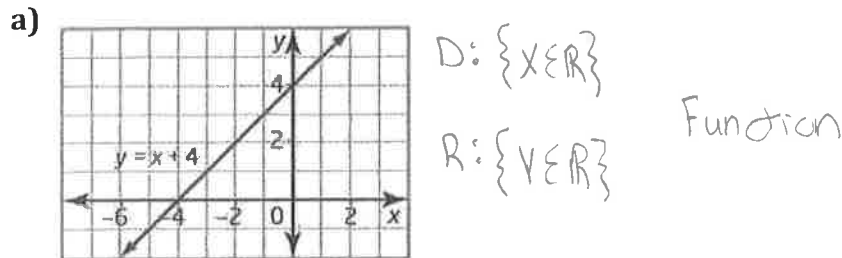
Range:  $\{y = -4, 0, 2, 4, 5\}$

x	y
-3	-4
-1	2
0	0
-3	5
2	4

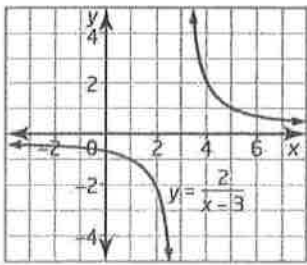


Is this relation a function? NO

4) State the domain and range of each relation. Then state if the relation is a function.



e)

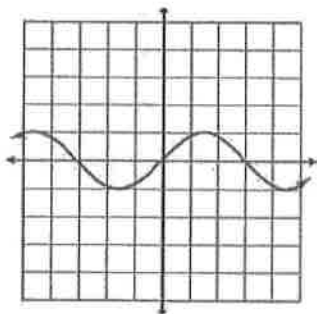


$$D: \{x \in \mathbb{R} \mid x \neq 3\}$$

$$R: \{y \in \mathbb{R} \mid y \neq 0\}$$

Funktion

f)

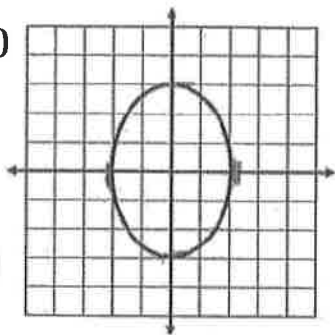


$$D: \{x \in \mathbb{R}\}$$

$$R: \{y \in \mathbb{R} \mid -1 \leq y \leq 1\}$$

Funktion

g)



$$D: \{x \in \mathbb{R} \mid -2 \leq x \leq 2\}$$

$$R: \{y \in \mathbb{R} \mid -3 \leq y \leq 3\}$$

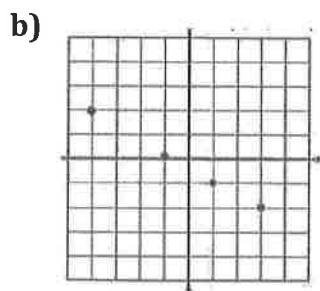
Not a function

5) Which of the following relations are functions?

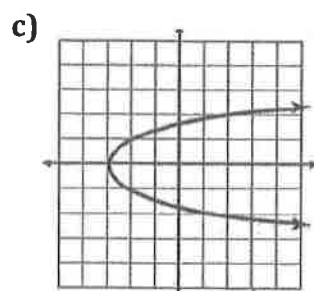
a)

x	y
2	-3
-1	0
5	5
3	2
2	1

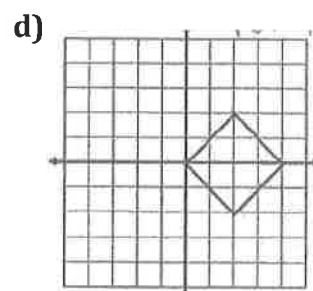
Not a  
Funktion



Funktion



Not a  
Funktion



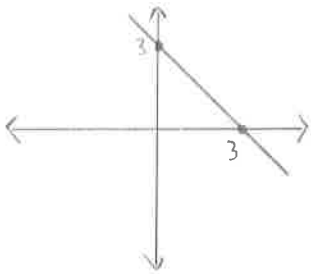
Not a  
Funktion

6) Determine the domain and range of each of the following relations. Use a graphing calculator or a graphing app to help if necessary. Make a rough sketch of the graph.

a)  $y = -x + 3$

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

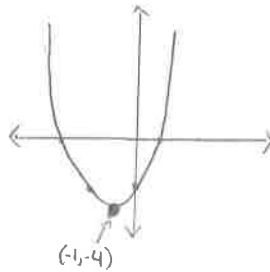
R:  $\{y \in \mathbb{R}\}$



b)  $y = (x + 1)^2 - 4$

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

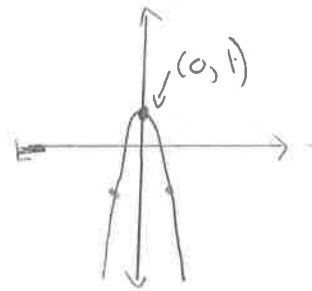
R:  $\{y \in \mathbb{R} \mid y \geq -4\}$



c)  $y = -3x^2 + 1$

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

R:  $\{y \in \mathbb{R} \mid y \leq 1\}$

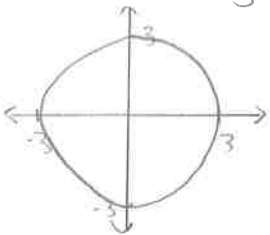


d)  $x^2 + y^2 = 9$

$r = 3$

D:  $\{x \in \mathbb{R} \mid -3 \leq x \leq 3\}$

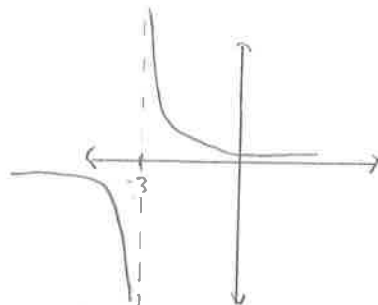
R:  $\{y \in \mathbb{R} \mid -3 \leq y \leq 3\}$



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

D:  $\{x \in \mathbb{R} \mid x \neq -3\}$

R:  $\{y \in \mathbb{R} \mid y \neq 0\}$

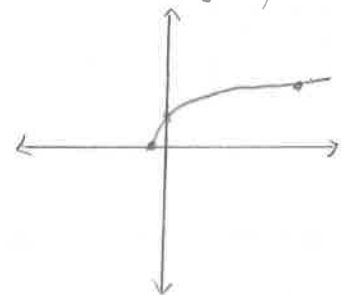


f)  $y = \sqrt{2x + 1}$

$2x + 1 < 0$   
 $x < -\frac{1}{2}$

D:  $\{x \in \mathbb{R} \mid x \geq -0.5\}$

R:  $\{y \in \mathbb{R} \mid y \geq 0\}$



7) Pam has 90 m of fencing to enclose an area in a petting zoo with two dividers to separate three types of young animals. The three pens are to have the same area. (11, 253)

a) Express the area function for the three pens in terms of  $x$ .

b) Determine the domain and range for the area function.

a)  $A = \left(\frac{90-4x}{2}\right)(x)$

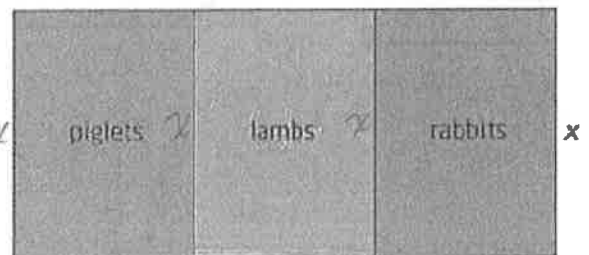
$= (45-2x)(x)$

$= 45x - 2x^2$

$= -2x^2 + 45x$

$x$ -int

$x = 0$  or  $45 - 2x = 0$   
 $45 = 2x$   
 $22.5 = x$



$\frac{90-4x}{2}$

$x$ -vertex =  $\frac{-45}{2(-2)}$   
 $= 11.25$

$y$ -vertex =  $-2(11.25)^2 + 45(11.25)$   
 $= 253.125$

vertex is  $(11.25, 253.125)$

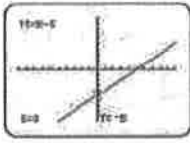
b) D:  $\{x \in \mathbb{R} \mid 0 < x < 22.5\}$

R:  $\{y \in \mathbb{R} \mid 0 < y \leq 253.125\}$

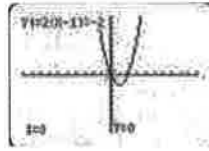
## Answers

1) a, b, and c are functions. d is not a function.

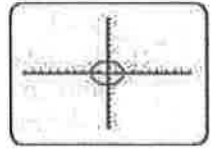
2) a) function



b) function

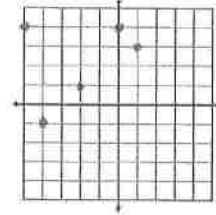


c) not a function



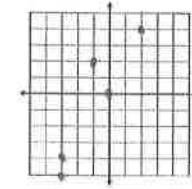
3) a)  $D: \{X \in \mathbb{R} | x = -5, -4, -2, 0, 1\}$   $R: \{Y \in \mathbb{R} | y = -1, 1, 3, 4\}$

x	y
-5	4
-4	-1
-2	1
0	4
1	3



b)  $D: \{X \in \mathbb{R} | x = -3, -1, 0, 2\}$   $R: \{Y \in \mathbb{R} | y = -4, 0, 2, 4, 5\}$

x	y
-3	-4
-1	2
0	0
-3	5
2	4



4) a)  $D: \{X \in \mathbb{R}\}$

$R: \{Y \in \mathbb{R}\}$

this relation is a function

b)  $D: \{X \in \mathbb{R}\}$

$R: \{Y \in \mathbb{R} | y \geq 0\}$

this relation is a function

c)  $D: \{X \in \mathbb{R} | x \geq 0\}$

$R: \{Y \in \mathbb{R}\}$

this relation is NOT a function

d)  $D: \{X \in \mathbb{R}\}$

$R: \{Y \in \mathbb{R} | y \leq -1\}$

this relation is a function

e)  $D: \{X \in \mathbb{R} | x \neq 3\}$

$R: \{Y \in \mathbb{R} | y \neq 0\}$

this relation is a function

f)  $D: \{X \in \mathbb{R}\}$

$R: \{Y \in \mathbb{R} | -1 \leq y \leq 1\}$

this relation is a function

g)  $D: \{X \in \mathbb{R} | -2 \leq x \leq 2\}$

$R: \{Y \in \mathbb{R} | -3 \leq y \leq 3\}$

this relation is NOT a function

5) b is the only relation that is a function

6) a) domain  $\{x \in \mathbb{R}\}$ , range  $\{y \in \mathbb{R}\}$

b) domain  $\{x \in \mathbb{R}\}$ , range  $\{y \in \mathbb{R}, y \geq -4\}$

c) domain  $\{x \in \mathbb{R}\}$ , range  $\{y \in \mathbb{R}, y \leq 1\}$

d) domain  $\{x \in \mathbb{R}, -3 \leq x \leq 3\}$ ;

range  $\{y \in \mathbb{R}, -3 \leq y \leq 3\}$

e) domain  $\{x \in \mathbb{R}, x \neq -3\}$ , range  $\{y \in \mathbb{R}, y \neq 0\}$

f) domain  $\{x \in \mathbb{R}, x \geq -0.5\}$ , range  $\{y \in \mathbb{R}, y \geq 0\}$

7) a)  $A = -2x^2 + 45x$  b)  $D: \{X \in \mathbb{R} | 0 < x < 22.5\}$   $R: \{Y \in \mathbb{R} | 0 < y \leq 253.1\}$

