

Date: _____

UNIT 3: FUNCTIONS & TRANSFORMATIONS**3.1 Relations, Domain, Range and Functions****A. Definitions**

Relation: A *relation* is an identified relationship between two variables that may be expressed as a set of *ordered pairs*, a *table of values*, a *graph*, or an *equation*.

Domain: The *domain, D*, is the set of all first elements (*x*-values) of a relation.

Range: The *range, R*, is the set of all second elements (*y*-values) of a relation.

Function: A *function* is a relation in which each first element (*x*-value) corresponds to exactly one second element (*y*-value).

Vertical Line Test: If any *vertical line* intersects the graph of a relation more than once, then the relation is not a function.

B. Examples

1. State the domain of each of the following relations.

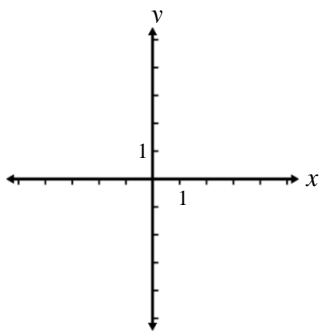
a) $y = \frac{x-1}{x^2-3x-4}$

b) $s = \sqrt{8-2t}$

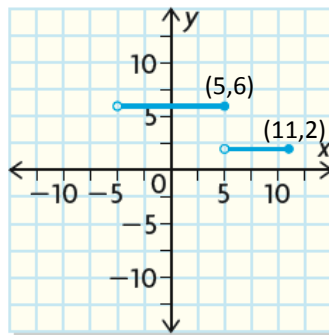
c) $y = \frac{1}{\sqrt{x^2-9}}$

2. State the domain and range. Determine if the relation is a function. Explain.

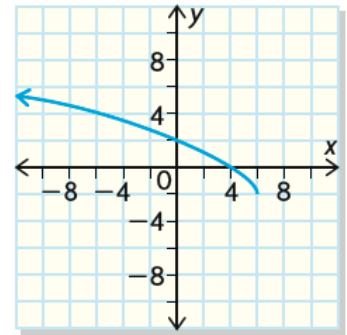
a) $\{(1,2), (3,5), (3,-3), (-1,2)\}$



b)



c)



i) $D =$ _____

i) $D =$ _____

i) $D =$ _____

ii) $R =$ _____

ii) $R =$ _____

ii) $R =$ _____

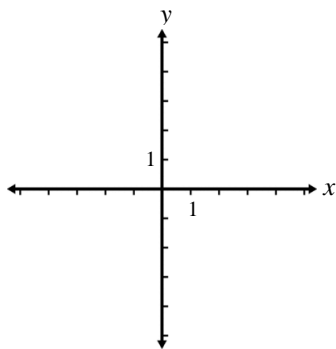
iii) *Function?* _____

iii) *Function?* _____

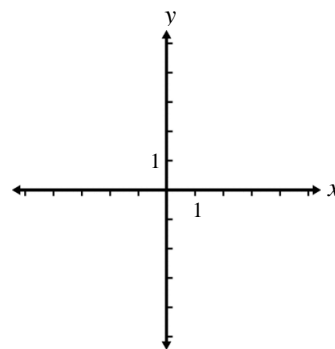
iii) *Function?* _____

3. Graph, and state the domain and range. Determine if the relation is a function. Explain.

a) $y = -x^2 - 2x + 3$



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



i) $D =$ _____

i) $D =$ _____

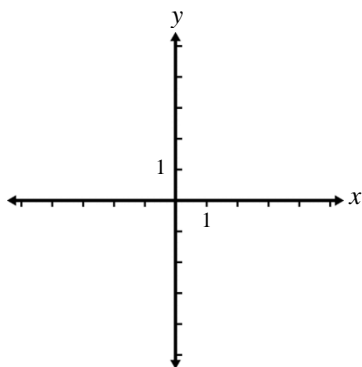
ii) $R =$ _____

ii) $R =$ _____

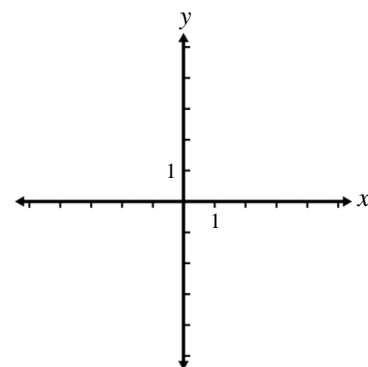
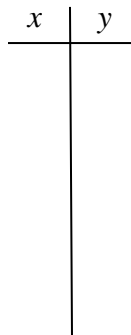
iii) *Function?* _____

iii) *Function?* _____

c) $2x + 3y = 6$



d) $x = y^2$



i) $D =$ _____

i) $D =$ _____

ii) $R =$ _____

ii) $R =$ _____

iii) *Function?* _____

iii) *Function?* _____

Date: _____

3.2 Function Notation**A. Definition**

Symbols such as $f(x)$, read as “ f at x ” or “ f of x ”, $g(x)$ and $h(x)$, are called **function notation**. $f(x)$ represents the value of y for a given value of x , so $y = f(x)$.

B. Examples

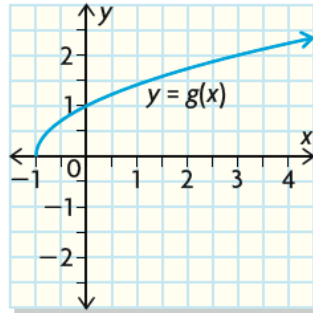
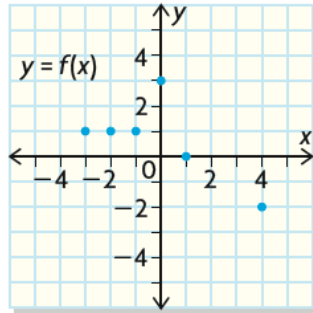
1. Rewrite the following equations in **function notation**.

a) $y = -3x + 2$

b) $y = -2x^2 - 5x + 2$

c) $h = -5t^2 + 30t + 4$

2. Using the graphs of $y = f(x)$ and $y = g(x)$ determine value(s) for each of the following.



a) $D_f =$ _____

$R_f =$ _____

b) $D_g =$ _____

$R_g =$ _____

c) $f(0)$

d) $g(-1)$

e) $g(3) - f(4)$

f) x if $g(x) = 1$

g) x if $f(x) = 1$

3. If $f(x) = -3x + 2$, find

a) $f(-1)$

b) $f(0)$

c) $f(2)$

d) $f\left(\frac{1}{6}\right) - f\left(-\frac{1}{9}\right)$

e) $f(-3a)$

f) $f(x-3)$

4. If $g(x) = -2x^2 - 5x + 2$, find

a) $g(-1)$

b) $g(3)$

c) $g\left(\frac{1}{2}\right)$

d) $g(3x)$

e) $g(a+3)$

5. If $f(x) = 5x + 8$, $g(x) = x^2 + 3x$ and $h(x) = \sqrt{4x + 1}$, find the value(s) of x , if

a) $f(x) = -7$

b) $g(x) = 18$

c) $f(x - 1) = g(2x + 1)$

d) $h(x) = 3\sqrt{5}$

e) $h(x^2 - x) = 0$

6. Sarah has 24 m of fencing to enclose a rectangular garden against the back of her house.
- Express the area, A , in m^2 of the garden as a function of its width, w , in m.
 - Determine the domain and range of the area function.
 - Determine the dimensions that give the maximum area.

