Unit 4 Functions Notes

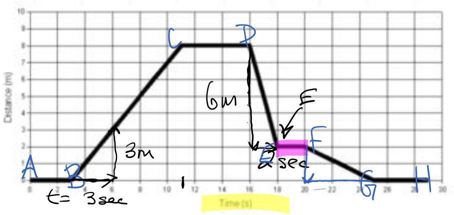
Unit 4
Linear Relations and Function

Learning Targets:

#1: I can relate a graph to a description or draw a graph given information
#2: I can determine whether a relation is linear or non-linear, and discrete or continuous
#3: I can write relations using five different methods (words, ordered pairs, table of values, graph and equation)
#4: I can determine whether a relations is a function and use and understanding function notation.
#5: I can determine the domain and range using words, number line, set notation, and interval notation.

Lesson 1 – Graphs of Relations

Example 1:



$S = \frac{d}{t}$ $\frac{m}{s}$

$\frac{3}{3} = 1$ m/s

$\frac{2m}{5sec}$ 0.4 m/s

Jennifer walks her dog with a retractable leash. She stops for a rest on a park bench while she continues to hold the end of the leash. The graph shows the distance the dog is away from the bench. Describe what the dog is doing.

A→B The dog is sitting next to Jennifer for 3 seconds

G/H sitting dogs.

B→C The dog walks away at $\frac{3}{3} = 1$ m/s.

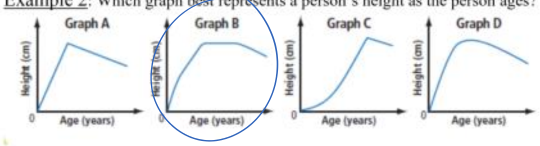
C→D The dog sits, speed $\frac{0}{5} = 0$ m/s, time 5 s

D→E The dog is retracted, speed = $\frac{6m}{2sec}$ = 3 m/sec

E→F The dog stops for 2 seconds

F→G The dog walks back to owner at 0.4 m/s

Example 2: Which graph best represents a person's height as the person ages?



Example 3:

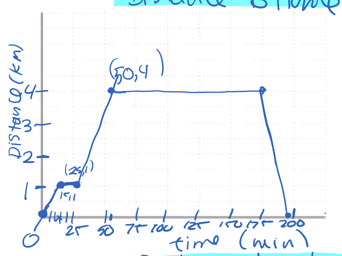
Frank leaves his home and walks 1 km to the store. After buying a drink, he slowly jogs the three kms to his friend's house, which is on the opposite direction of his house. Frank visits with his friend for a while and then runs directly home. Using the distances given, draw

(a) Distance time graph that shows Franks distance from home. Explain each section of the graph.

(b) Distance time graph that shows Franks distance from the store.

(c) Total distance travelled versus time.

Distance to Home



t (min)	d (km)
0	0
15	1
25	1
55	4
175	4
195	0

go to store

10 min get drink

30 min jog

at friend 120 min

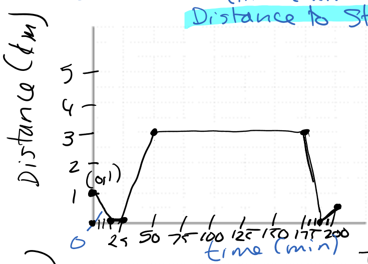
20 min run

1 km / 5 min

+3 km

go home 4 km

Distance to Store



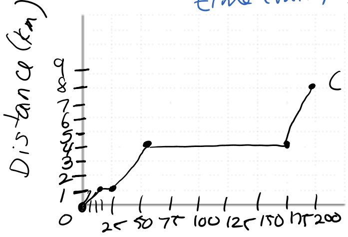
time (min)	d (km)
0	1
15	0
25	0
55	3
175	3
190	0
195	1

+3

run to friends

15 min + run past store

Total Distance vs Time



t	d
0	0
15	1
25	1
55	4
175	4
195	8

+3

+4

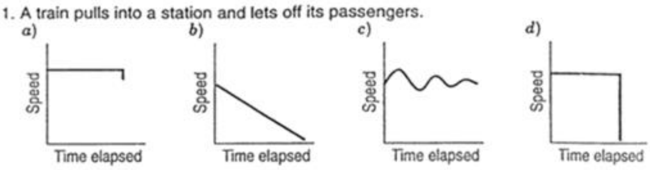
Assignment: Pg. 69/70 + Identifying Qualitative Graphs Worksheet (both sides)

Textbook Pg 204 #1-4

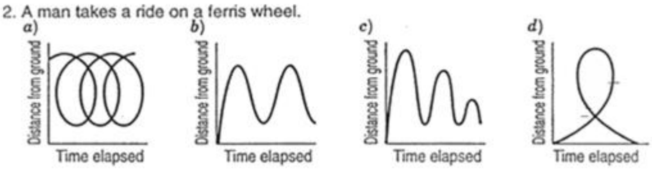
Identifying Qualitative Graphs

Indicate which graph matches the statement.

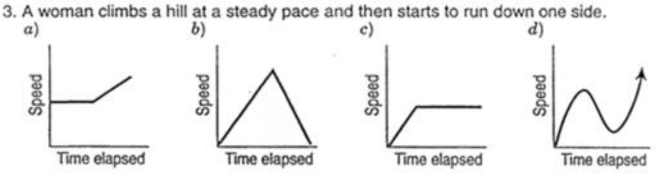
1. A train pulls into a station and lets off its passengers.



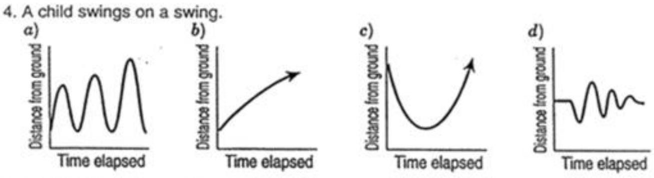
2. A man takes a ride on a ferris wheel.



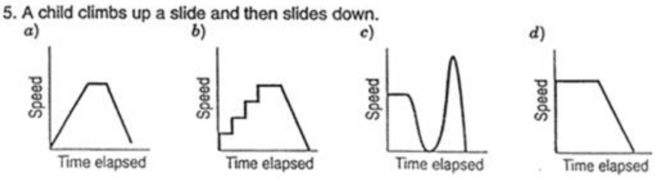
3. A woman climbs a hill at a steady pace and then starts to run down one side.



4. A child swings on a swing.

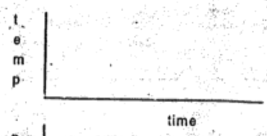


5. A child climbs up a slide and then slides down.

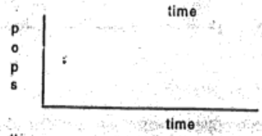


SHEET

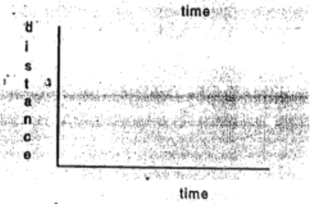
7. You pour some cold water from the refrigerator into a glass, but forget to drink it. As the water sits there, its temperature depends on the number of minutes that have passed since you poured it.



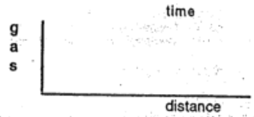
8. You pour some popcorn into a popper and turn it on. The number of pops per second depends on how long the popper has been turned on.



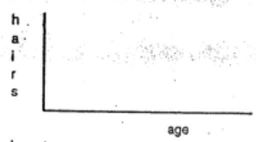
9. As you play with a yo-yo, the number of seconds that have passed and the yo-yo's distance from the floor are related.



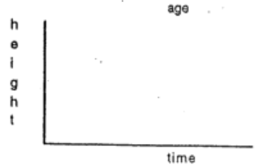
10. You fill up your car's gas tank and start driving. The amount of gas you have left in the tank depends on how far you have driven.



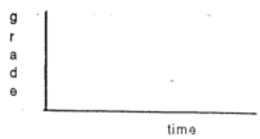
11. Dan Druff's age and the number of hairs he has growing on his head are related.



12. You climb to the top of the 190 meter tall Tower of the Americas and drop your algebra book off. The distance the book is above the ground depends on the number of seconds that have passed since you dropped it.



13. The grade you could make on a particular test depends upon how long you study for it.



Lesson 2 – Linear Relations

Important Terms:

Relation: A relationship between two quantities. This relationship can be represented in words, as an equation, as ordered pairs, as a table of values or as a graph.

Linear Relations: A relation that forms a straight line when data is plotted on a graph. *The rate of change is constant. Change in y and change in x is constant.*

Non-linear relation: *A relation that does not form a straight line when the data is plotted on the graph. Change in x and/or change in y values between consecutive points is not constant.*

Discrete *data: Data values on a graph that are not connected because there cannot be points between the points. Such as plotting cost per a person. It is not possible to pay for part of a person.*

Continuous *data: Data values on a graph that are connected between points. These values are measurements such as distance, time or volume. There will be points between points.*

Independent *variable: The variable for which values are chosen. The input value or horizontal value (x value) on a graph.*

Dependent *variable: The variables whose values depend on what is done to the independent variable. The output or variable always graphed on the vertical axis (y value).*

Example 1:

List 5 ways you can write a relationship between 2 quantities.

table of values, equation, ordered pairs (coordinates)

graph, words

Example 2:

Convert $y = 2x - 3$ to a table of values, a set of ordered pairs and a graph.

$\boxed{y = 2x - 3}$

input

x	-2	-1	0	1	2
y	-7	-5	-3	-1	1

$y = 2(-2) - 3$
$= -4 - 3$
$= -7$

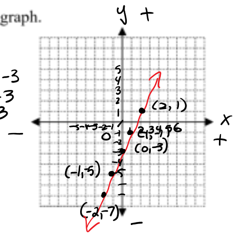
ordered pairs

(x, y)

$(-2,-7)$ $(-1,-5)$ $(0,-3)$ $(1,-1)$ $(2,1)$

$y = 2(0) - 3$
$= 0 - 3$
$= -3$

$y = 2(-1) - 3$
$= -2 - 3$
$= -5$



Example 3:

Denise walks to school at a constant speed. She is able to do this because there is no traffic on her route. She has found that she walks at a rate of 1.5 m/s. Her walk to school takes her 15 minutes.

(a) Identify the relationship as linear or a non-linear. Explain how you know.

$d = s \cdot t$

Linear

she walks at a constant rate (speed) so change in distance is always 1.5m & change in time is 1 sec

(b) Create a variable to represent each quantity in the relation. Which is the independent variable? Let d = distance (m) ; Let t = time (min)

independent variable (x-axis)

(c) Create a table of values for this relation. What are the appropriate values for the independent variable? → min $\frac{1.5m}{1sec} = \frac{90m}{60sec}$

1min = 60sec

time → 3min intervals

(d) Create a graph for the relation. Are the data discrete or continuous?

$d = 1.5t$ → $\boxed{d = 90t}$

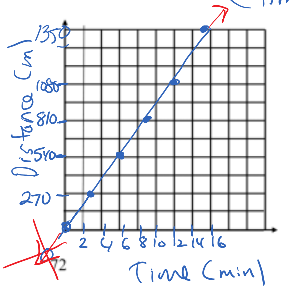
time in sec

time is in min.

(0, 0)

t (min)	d (m)
3	270
6	540
9	810m
12	1080
15	1350m

+270



$d = 90(6)$
$d = 540\ m$

Total time 15 min.

$d = 90(15)$
$d =$

90m/min , 15min

Example 4:

Determine whether each relation is linear. Explain why or why not.

a) The relationship between the cost to rent a banquet hall and the number of people attending the banquet, if the hall charges \$150 plus \$6 for each person who attends

per rate

b) The relation described by the equation $x^2+y^2=16$

c) The relation described by the set of ordered pairs {(10,6), (15, -2), (20,-10),(25, -18), (30, -26)}

d) The relation described by the set of ordered pairs {(-3,-4), (-1,2), (1,8), (3,14), (5,18)}

e) The relation described by the set of ordered pairs {(-5,10), (0,7), (5,4), (10,1), (20, -5)}

a) $C = \$150 + 6p$ ← rate → b/c rate per person is always \$6 the relation is linear.

b) $x^2 + y^2 = 16$ when plotted creates a circle/or y degree > 1 than line will curve so not linear

c)

x	10	15	20	25
y	6	-2	-10	-18

+5 +5 +5

-8 -8 -8

see if slope = rate of change is constant

Δx vs Δy
$= 5$ $= -8$

Both Δx, Δy are constant then rate of change → slope is constant then linear

$\Delta x = +2$

d)

x	y
-3	-4
-1	2
1	8
3	14
5	18

+2 +2 +2 +2

+6 +6 +6 +4

slope $= \frac{6}{2} = 3$

slope $= \frac{\Delta y}{\Delta x} = \frac{4}{2} = 2$

e)

x	-5	0	5	10	20
y	10	7	4	1	-5

Δx +5 +5 +5 +10

-3 -3 -3 -6

$m = \frac{\Delta y}{\Delta x} = \frac{-6}{10} = \frac{-3}{5}$

$m = \frac{\Delta y}{\Delta x} = \frac{-3}{5}$ same slope

Slope is constant skipped ptn (15,-2) relation is linear.

Example 5:

Delview dance tickets are \$6 per ticket. Is the relation discrete or continuous? Does the data represent a linear or non-linear relationship between the number of tickets purchased and the cost of the tickets? Represent the relationship all 5 ways.

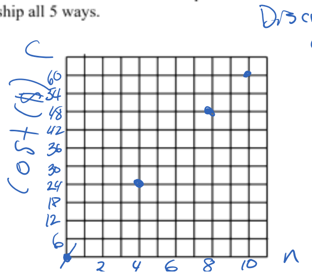
Discrete data

Let C be the cost (\$) &

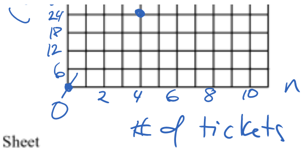
Let n be the # of tickets

$C = 6n$

n	C
0	0
4	24
8	48
10	60



4	24
8	48
10	60



Assignment: Pg. 218 + 6.2 Extra Practice Sheet
1–4, 7–9, 12

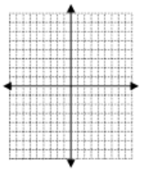
Quiz on 6.1 and 6.2 on ______________________

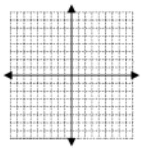
Section 6.2 Extra Practice

1. Convert each relation from its current representation to a set of ordered pairs and to a graph.

a)

x	y
4	−2
1	−1
0	0
1	1
4	2



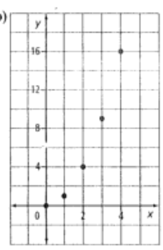


b) $y = 2x - 3$

2. Convert each relation from its current representation to a table of values and to words.

a) … (−1, −2), (0, 0), (1, 2), (2, 4), …

b)



3. Determine whether each relation is linear or non-linear. Explain your decision.

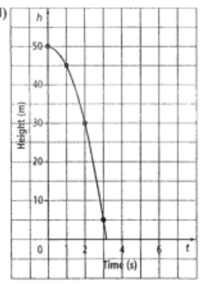
a) $y = \frac{9}{5}x + 32$

b)

x	y
1	1
2	1
3	2
4	3
5	5

c) (−5, 0), (−2, 1), (1, 2), (4, 3), (7, 4)

d)



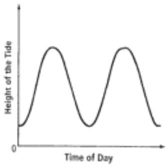
4. For each relation, state the dependent variable and the independent variable.

a) $V = \frac{4}{3}\pi r^3$

b)

Age of a Person (years)	Height (cm)
2	87
3	96
4	104
5	110

c)



5. The table of values shows the cost of movie tickets at a local theatre.

Number of Tickets	Cost ($)
1	12
2	24
3	36
4	48

a) Is this a linear or non-linear relationship? Explain how you know.

b) Assign a variable to represent each quantity in the relation. Which variable is the dependent variable and which is the independent variable?

c) Are the data discrete or continuous? Explain how you know.

d) Graph the data.

6. A white-tailed deer can sprint up to 48 km/h. One deer is walking at 8 km/h. Consider the relationship between the total distance, in kilometres, travelled by this deer and time, in hours.

a) Assign a variable to represent each quantity in the relation. Identify the dependent variable and the independent variable.

b) Assume the deer walks for 3 h without stopping. Create a table of values for this relation.

c) Graph the relation.

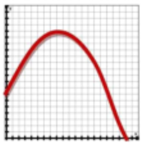
d) Is the relation linear or non-linear? Explain.

e) Is the relation continuous or discrete? Explain.

Warm-up:

1. Would the graph of an infant's height versus their age be continuous or discrete? Explain.

2. Describe a situation for the following graph:



3. Jane goes to the mall to get her best friend a birthday gift. It took her 30 minutes to get to the mall from her home driving 50 km/hr. She shops for 2 hours and then returns home in 20 minutes driving 60 km/hr. Draw the following graphs:

(a) Distance travelled versus time

(b) Distance from home versus time

4. Determine which set of numbers is linear: A: {(-2, 2), (-1, 6), (0,0), (1, 2), (2, 6)}
B: {(-3, 5), (-2, -3), (-1, -1), (0, 1), (1, 3), (2, 5)}

5. The cost to make colour prints at staples is $2 per a copy plus a $1 service charge.

Define the independent and dependent variable in this relation.
Let ____ = _____________, the independent variable
Let ____ = _____________, the dependent variable

Create an equation showing the relationship between cost and the number of prints using the defined variables. __________________

Create a table of values and use these to complete the graph above.

Is this relation continuous or discrete? Explain.

Lesson 3 - Functions

Definition:
Function – a rule that gives a single output number for every valid input number.

input → (X, Y) ← output

Example 1:

Determine if the following is a function or not:

(a) {(2, 3), (3, 4), (2, 5), (5, 6), (6, 7)}

x	y
2	3
3	4
2	5
5	6
6	7

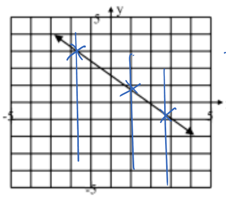
This is not a function because when $x = 2$ $y = 3, 5$ ∴ more than one output for given input.

(b)

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

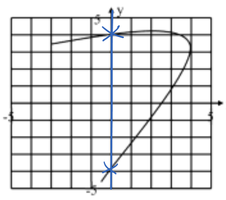
Yes, only one output for each input.

(c)



Yes a function b/c the graph passes vertical line test → only one value of y (output) for each value of x (input)

(d)



Not a function → doesn't pass vertical line test as many inputs (x) have 2 outputs

THE VERTICAL LINE TEST ALSO HELPS TO DETERMINE FUNCTIONS

Definition:

Function Notation:

- To represent functions, we use symbols: f(x) , g(x) , h(x)
- f(x) reads "f of x". It means the equation is a function that has x as the input variable.
- f(x) is another name for y. For example: f(x) = 3x + 1 is the same as y = 3x + 1.
- Typically we are given a numerical value to SUBSTITUTE for x in the function.

Example 2:

a) If f(x) = -2x + 1, find the value of x if: (a) f(x)=12 means $y = 12$ find $x = ?$ (b) f(x) = -20

$f(x) = 12$

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

$12 = -2x + 1$

$-1 \quad -1$

$\frac{11}{-2} = \frac{-2x}{-2}$

$\boxed{x = -5\frac{1}{2}}$

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

$-20 = -2x + 1$

$-1 \quad -1$

$\frac{-21}{-2} = \frac{-2x}{-2}$

$x = \frac{21}{2}$

$x = 10\frac{1}{2}$

b) Given f(x) = 3x² – x – 6, find: (a) f(2) ie $x = 2$ find $y = ?$ (b) f(-1)

$f(2) = 3(2)^2 - 2 - 6$

$f(2) = 3 \cdot 4 - 2 - 6$

$f(2) = 12 - 8$

$\boxed{f(2) = 4}$ ie $y = 4$

$f(\ ) = 3x^2 - x - 6$

$f(-1) = 3(-1)^2 - (-1) - 6$

$f(-1) = 3 \cdot 1 + 1 - 6$

$f(-1) = 3 + 1 - 6$

$f(-1) = 4 - 6$

$f(-1) = -2$

Evaluate the following expressions given the functions below:

$g(x) = -3x + 1$ $\quad f(x) = x^2 + 7$ $\quad h(x) = \frac{12}{x}$ $\quad j(x) = 2x + 9$

a. g(10) = $-3(10) + 1$

$g(10) = -30 + 1$

$g(10) = -29$

b. f(3) =

c. h(–2) = $\frac{12}{-2}$

$\boxed{h(-2) = -6}$

d. j(7) =

e. h(a) = $\frac{12}{a}$

f. g(b+c) = $-3(b+c) + 1$

$g(b+c) = -3b - 3c + 1$

h. Find x if g(x) = 16

$16 = -3x + 1$

$-1 \quad -1$

$\frac{+15}{-3} = \frac{-3x}{-3}$ $\boxed{x = -5}$

i. Find x if h(x) = –2

$\frac{-2}{1} = \frac{12}{x}$

$\frac{-2x}{-2} = \frac{12}{-2}$ $\boxed{x = -6}$

j. Find x if f(x) = 23

$23 = x^2 + 7$

$-7 \quad -7$

$\sqrt{16} = \sqrt{x^2}$

$\boxed{4 = x}$

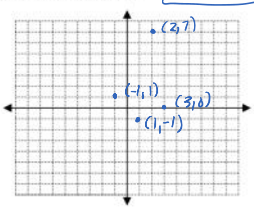
Change the following statements into coordinate points and then plot them!

a. f(–1) = 1 (x, y) → (-1, 1)

b. f(2) = 7 (2, 7)

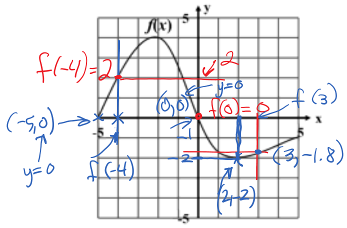
c. f(1) = –1 (1, -1)

d. f(3) = 0 (3, 0)



Example 3:

Given this graph of the function f(x):



Find:

a. $f(-4) =$ 2   **b.** $f(0) =$ 0   **c.** $f(3) =$ est. ~ −1.75   **d.** $f(-5) =$ 0

y x = −4, y = ?   x = 0, y =

e. x when $f(x) = -2$ **f.** x when $f(x) = 0$

x = ? y = −2   y y = 0

x = 2   x = 0, −5

Example 4:

Fran collected data on the number of feet she could walk each second and wrote the following rule to model her walking rate $d(t) = 4t$.

a. What is $d(12)$? What does $d(12)$ mean?

$d(12) = 4(12)$ The distance in "feet" fran walks in 12 sec.

$d(12) = 48$

b. What is $d(t) = 100$? What does $d(t) = 100$ mean?

$\frac{100}{4} = \frac{4t}{4}$ $d(t) = 100$ To walk 100 ft takes 25 sec.

$t = 25$

c. How can the function rule be used to indicate a time of 16 seconds was walked?

$d(t) = 4(t)$ so $d(16) = 4 \times 16$

$f(16) = 64$

Fran walked 64 ft in 16 s

d. How can the function rule be used to indicate that a distance of 200 feet was walked?

distance = 200 ft $d(t) = y$

$d(t) = 4t$

$\frac{200}{4} = \frac{4 \cdot t}{4}$ fran walked 200ft in 50 seconds.

$t = 50$

Example 5:

Trevor rents a car for a base fee of \$25 per day plus 10 cents for each kilometre. Trevor's bill per day can be modelled by the relation C= 0.10n + 25, where C is the total charge, in dollars, and n is the number of kilometers.

$C = 0.10n + 25$

(a) Write the relation in function notation.

$C(n) = 0.10n + 25$

(b) Make a table of values. Graph the function if Trevor drives up to 200 km in a day.

Δn = +20   +50

n (km)	C (\$)
0	25
20	27
40	29
60	31
80	33
100	35
150	40
200	45

ΔC: +2, +2, +2, +5, +5

$C(n) = 0.10n + 25$

$C(20) = 0.10(20) + 25$

$= 2 + 25$

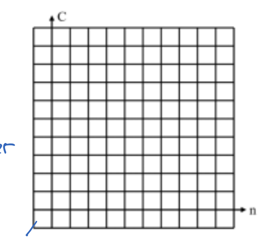
$C(20) = 27$

$C(150) = 0.10(150) + 25$

$= 15 + 25$

$= 40$

$\boxed{m = \frac{5}{50} = \frac{1}{10} = 0.1}$



(c) If Trevor's bill was \$27.50, how many kilometres did he drive that day?

$\cancel{C(n)} = 0.10n + 25$

$27.50 = 0.10n + 25$

$-25 \qquad -25$

$\frac{2.50}{0.10} = \frac{0.10n}{0.10}$

$n = 25$

$\boxed{\text{He drove 25 km}}$

Assignment: Pg. textbook 244

#1-6, 7a, 8

11ab, 14

I, I, I, 10
11 & b, 14

He drove 25 km

80

Lesson 4 – Representing Inequalities and Domain and Range

Algebraic Inequalities: What is the meaning of each of these symbols?

Symbol	Meaning	Number Line Symbol
$>$		o——→
$<$		←——o
$\geqslant$		•——→
$\leqslant$		←——•

For the following graphs, determine the inequality and its verbal phrase "n"

GRAPH	INEQUALITY	VERBAL PHRASE
$-\infty$	$n < 2$	The number is less than 2.
	$n > -2$	The number is greater than -2.
$-\infty$	$n \leq 1$	The # is less than or equal to 1
$+\infty$	$n \geq 0$	The # is greater than or equal to zero.
	$n \leq -3$ and $n \geq -1$	The # is less than or equal to -3 & greater than or equal to -1.
$-3 < n < 1$	smaller value $-3 \leq n < 1$ (variable, bigger #)	The number is less than 1 but greater than or equal to -3.
	$n = -2, 1, 3$	→ The # equals $-2, 1, 3$.

Inequalities stated as above form the basis for *set notation*. This will be discussed next class.

For example:
Given the number line, $1 \leq x < 5$ as an inequality we write $1 \leq x < 5$

However in interval notation, we write this as [1, 5). Note the different brackets.

[1, 5) ← not included
included.

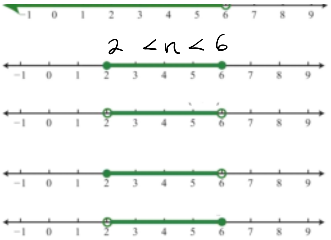
only use for continuous data not discrete

81

- *Interval notation*
  - Has 2 types of symbols: brackets and parentheses [4, 12)
  - [ ] → brackets
    - Inclusive (the number is included)
    - $=, \leq, \geq$
  - ( ) → parentheses
    - Exclusive (the number is excluded)
    - $\neq, <, >$
- The infinity symbols $-\infty$ and $+\infty$ are always written in parentheses ( ).

For each graph, write the inequality and interval notation

Graph	Inequality	Interval notation
$n \geq 3$, $3 \leq n < \infty$	$n \geq 3$	$[3, \infty)$
	$n > 3$	$(3, \infty^+)$
$-\infty$, 6	$n \leq 6$	$(-\infty, 6]$
	$n < 6$	$(-\infty, 6)$
$2 < n < 6$	$2 \leq n \leq 6$	$[2, 6]$
	$2 < n < 6$	$(2, 6)$



$2 < n < 6$

$2 \le n \le 6 \quad [2, 6]$

$2 < n < 6 \quad (2, 6)$

$2 \le n < 6 \quad [2, 6)$

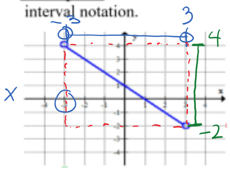
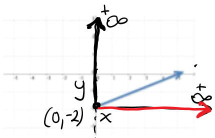
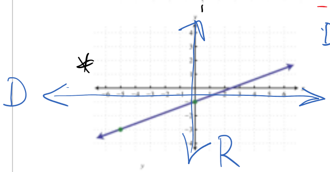
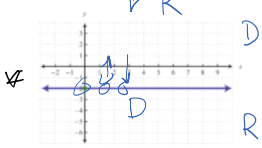
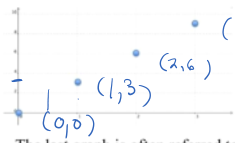
$2 < n \le 6 \quad (2, 6]$

$(1,0)\ (3,5)\ (5,9) \longrightarrow x = 1, 3, 5$

Domain and Range

- Domain (D) is the set of all first coordinates of ordered pairs in a relation.
  (Input values → x - values) D $x = 1, 3, 5$
- Range (R) is the set of all second coordinates of the ordered pairs in a relation.
  (Output values → y – values) R $y = 0, 5, 9$

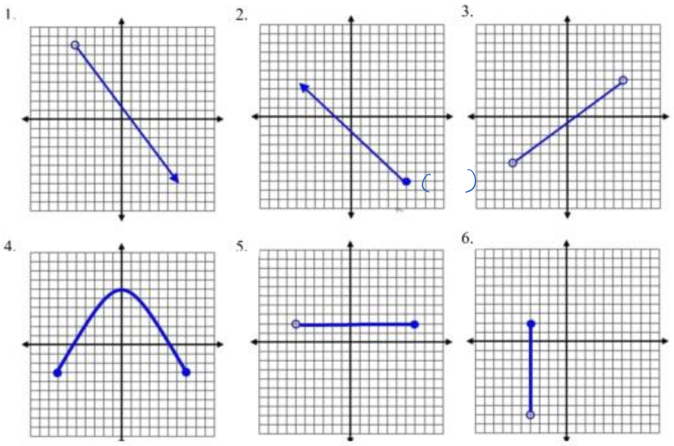
Example 1: State the domain and range of each graph. Use a number line, inequality and interval notation.

		Number line	Inequality	Interval Notation
	D	$-3 < x < 3$; $-3 \quad 0 \quad 3$	$-3 < x < 3$	$(-3, 3)$
	R	$-2 \quad 0 \quad 4$	$-2 < y < 4$	$(-2, 4)$
	D	$0 \quad \infty$	$x \ge 0$ $0 \le x < \infty$	$[0, \infty)$
	R	$-2 \quad 0$	$y \ge -2$ $-2 \le y < \infty$	$[-2, \infty)$
	D	$-\infty \quad 0 \quad +\infty$	$x \in \mathbb{R}$ $-\infty < x < \infty$	$(-\infty, \infty^{+})$
	R	$+\infty \quad 0$	$y \in \mathbb{R}$	$(-\infty, \infty^{+})$
	D	0	$-\infty < x < +\infty$	$(-\infty, +\infty)$
	R	$-2 \quad 0$	$y = -2$	$[-2]$
	D	$0 \quad 1 \quad 2 \quad 3$	$x = 0, 1, 2, 3$	N/A
	R	$0 \quad 3 \quad 6 \quad 9$	$y = 0, 3, 6, 9$	N/A

because data is discrete
no interval
no pts between pts

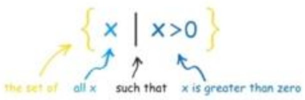
The last graph is often referred to as discrete data.

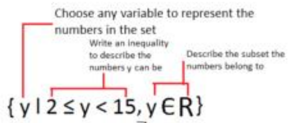
Homework: Determine the domain and range for the following graphs as a number line, inequality and in interval notation.



1. D ⟷ R ⟷ Inequality D R Interval notation	2.	3
4.	5.	6.

When writing domain and range in set notation it is required to write the set of numbers the domain and range belong to.

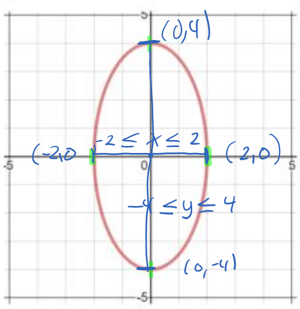




The following are some subsets the numbers can belong to

- $\mathbb{Z}$ **The set of integers**
- $\mathbb{N}$ **The set of natural numbers (positive integers)**
- $\mathbb{Q}$ **The set of rational numbers**
- $\mathbb{R}$ **The set of real numbers**

For example:
Given the graph to the right.
Is this a function?



If we assume this relation continues to infinity (which it does), in set notation:

The domain is: $\mathbb{R}$

$\{x| -2 \le x \le 2, x \in \mathbb{R}\}$ ✓

Or

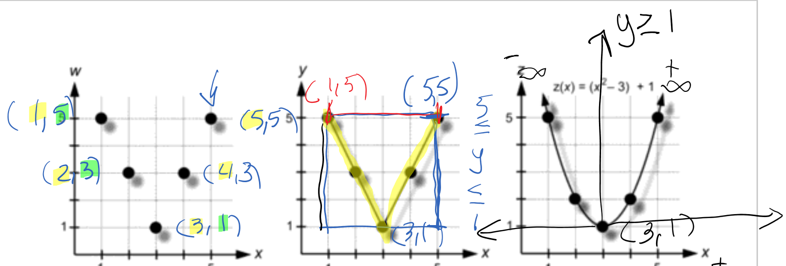
$\{x|x \ge -2 \text{ and } x \le 2, x \in \mathbb{R}\}$

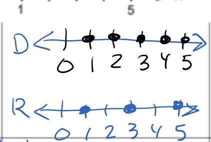
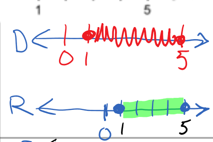
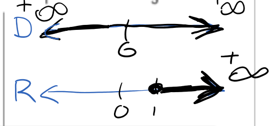
In English, $\{x| -2 \le x \le 2, x \in \mathbb{R}\}$, mean "x, such that, x is greater than or equal to -2 and less than or equal to 2 and x is a member of the real number." Generally, mathematicians use the first notation.

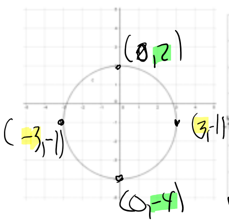
$y \ge -4$ & $y \le 4$

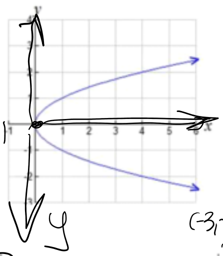
The range for this graph is:

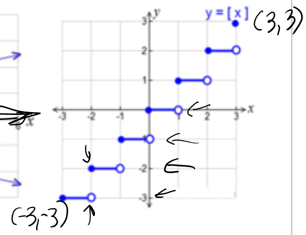
$\{y| -4 \le y \le 4, y \in \mathbb{R}\}$



Number Line			
Set Notation	D $\{x \mid x = 1, 2, 3, 4, 5, x \in \mathbb{N}\}$ or $\{x \mid 1 \le x \le 5, x \in \mathbb{N}\}$ R $\{y \mid y = 1, 3, 5, y \in \mathbb{N}\}$	$\{x \mid 1 \le x \le 5, x \in \mathbb{R}\}$ $\{y \mid 1 \le y \le 5, y \in \mathbb{R}\}$	D $\{x \mid x \in \mathbb{R}\}$ R $\{y \mid y \ge 1, y \in \mathbb{R}\}$
Interval Notation	N/A b/c discreet points	D $[1, 5]$ R $[1, 5]$	D (∞, ∞) R $[1, \infty)$







Number Line	D: -3 0 3 R: -4 0 2	R: 0 D: 0	D: -3 0 3 R: -3 -2 -1 0 1 2 3
Set Notation	D $\{x \mid -3 \le x \le 3, x \in \mathbb{R}\}$ R $\{y \mid -4 \le y \le 2, y \in \mathbb{R}\}$	R $\{y \mid y \in \mathbb{R}\}$ D $\{x \mid x \ge 0, x \in \mathbb{R}\}$	$\{x \mid -3 \le x \le 3, x \in \mathbb{R}\}$ integers $\{y \mid -3 \le y \le 3, y \in \mathbb{Z}\}$
Interval Notation	D $[-3, 3]$ R $[-4, 2]$	D $[0, \infty)$ R $(-\infty, \infty)$	$\{y \mid y = -3, -2, -1, 0, 1, 2, 3, y \in \mathbb{Z}\}$ D $[-3, 3]$ R N/A → discreet data

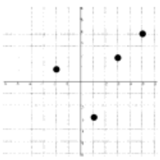
The last graph is often referred to as ___Step___ function.

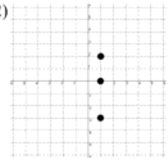
Assignment: Domain and Range worksheet + Nelson textbook pg. 233-235, 1-11
McGraw textbook pgs. 301-304 #1-11

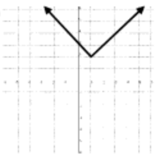
Quiz on Domain and Range on ____________________

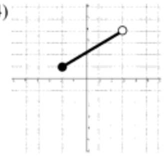
Domain and Range Homework

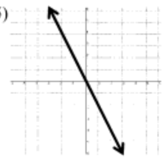
Give the domain and range of each in set notation. Tell if it is a function. Yes or No!

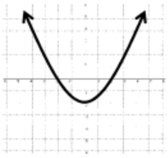
1) 

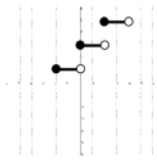
2) 

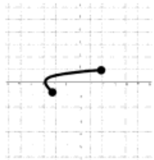
3) 

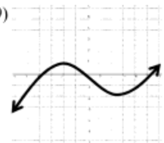
4) 

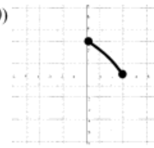
5) 

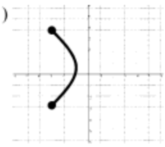
6) 

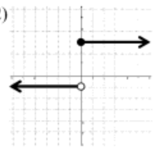
7) 

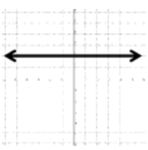
8) 

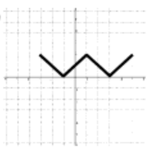
9) 

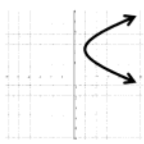
10) 

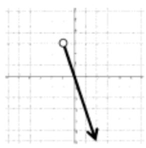
11) 

12) 

13) 

14) 

15) 

16) 

Give the domain and range of each. Tell if it is a function.

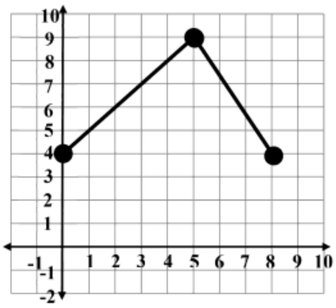
17) {(5, 2), (–3, 1), (5, –4), (0, 11)}

18) {(–6, –8), (5, 1), (9, –4), (7, 1), (15, 0)}

Answers:

1. D={–2, 1, 3, 5}
   R={–3, 1, 2, 4}
   Yes
2. D={1}
   R={–3, 0, 2}
   No
3. D={all reals}
   R={y≥2}
   Yes
4. D={–2≤x<3}
   R={1≤y<4}
   Yes
5. D={all reals}
   R={all reals}
   yes
6. D={all reals}
   R={y≥–2}
   yes
7. D={–2≤x<4}
   R={1, 3, 5}
   yes
8. D={–3≤x≤2}
   R={–1≤y≤1}
   no
9. D={all reals}
   R={all reals}
   yes
10. D={0≤x≤3}
    R={0≤y≤3}
    yes
11. D={–3≤x≤–1}
    R={–3≤y≤4}
    no
12. D={all reals}
    R={–1, 3}
    yes
13. D={all reals}
    R={2}
    yes
14. D={–3≤x≤5}
    R={0≤y≤2}
    yes
15. D={x≥1}
    R={all reals}
    no
16. D={x>–1}
    R={y<3}
    yes
17. D={–3, 0, 5}
    R = {–4, 1, 2, 11}
    no
18. D={–6, 5, 7, 9, 15}
    R={–8, –4, 0, 1}
    yes

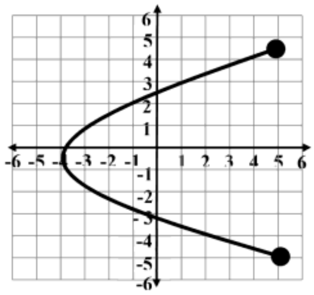
Practice Quiz



For the graph of f(x):

1. Find f(2) =
2. Find x such that f(x) = 9

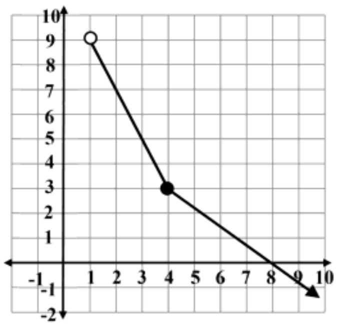
   x=
3. Find f(0) the y-intercept.
   Give ordered pair (,)
4. What is the DOMAIN?
5. What is the RANGE?



For the graph of f(x):

1. Find f(1) =
2. Find x such that f(x) = 2

   x=
3. What is the DOMAIN?
4. What is the RANGE?



For the graph of f(x):

1. Find f(3) =
2. Find x such that f(x) = 3
   x=
3. Find x, if f(x) =0.
   This is the x -intercept.
   Give ordered pair (,)
4. What is the DOMAIN?
5. What is the RANGE?

90

Function Notation:

1) If $f(x)=5-7x$, then find

a. $f(-3)$ b. $3f(2)$ c. x such that $f(x) = -2$

2. If $g(x)=3x^2+5x$, then find

a. $g(-2)$ b. $g(3)-9$ c. $-4g(-1)$