Name: KEY

Foundations of Math & Pre-Calculus 10
Chapter 6 ~ Linear Equations

Lesson 5.6 ~ Properties of Linear Relations

In a **linear relation**, a constant change in the independent variable results in a constant change in the dependent variable.

To calculate the **rate of change**, we use the equation $\frac{change\ in\ dependent\ variable}{change\ in\ independent\ variable}$.

Example #1: Which table of values represents a linear relation? Justify your answer.

a) The relation between the number of bacteria in a culture, n, and time, t minutes.

t	n	
0	1	
		+1
20	2	
		+2
40	4	
		+4
60	8	
		+8
80	16	
		+16
100	32	

(+20 between each pair of rows)

* not linear since change in 'n' is not constant

b) The relation between the amount of goods and services tax charged, T dollars, and the amount of the purchase, A dollars.

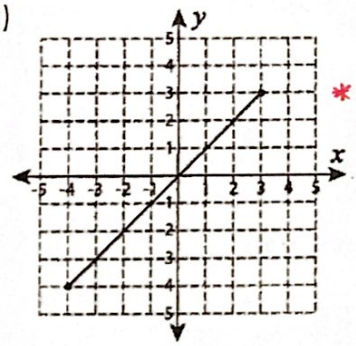
A	T	
60	3	
		+3
120	6	
		+3
180	9	
		+3
240	12	
		+3
300	15	

(+60 between each pair of rows)

* linear since a constant change in 'A' produces a constant change in 'T'

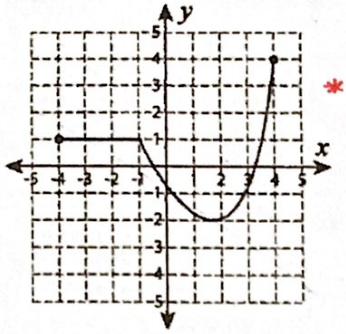
Example #2: Which graphs represent linear relations? Explain how you know.

a)



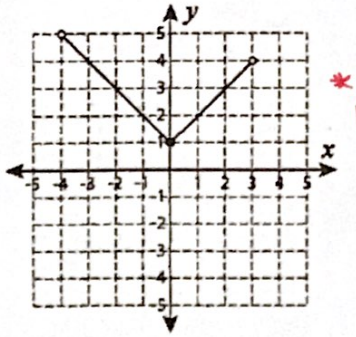
* linear

b)



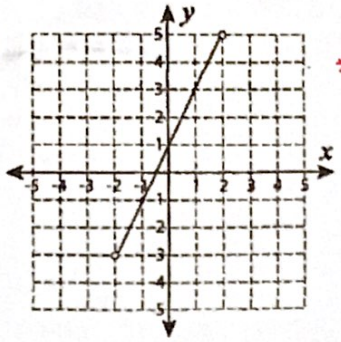
* not linear

c)



* not linear

d)



* linear

Example #3: Calculate the rate of change for each linear relation.

a) $y = 4x + 2$

x	y
−10	−38
−5	−18
0	2
5	22
10	42

+5, +5, +5, +5 (between x values)

+20, +20, +20, +20 (between y values)

rate of change = $\frac{20}{5}$ = 4

b) A dogsled moves at an average speed of 10 km/h along a frozen river. The distance travelled is related to time.

Time (hours)	Distance Traveled (km)
0	0
1	10
2	20
3	30
4	40

+1, +1, +1, +1

+10, +10, +10, +10

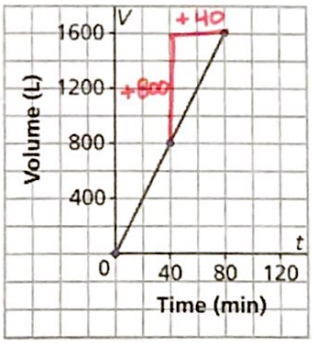
rate of change = $\frac{10\text{ km}}{1\text{ hr}}$

= 10 km/h

c) A hot tub contains 1600 L of water. Graph A represents the hot tub being filled as a constant rate. Graph B represents the hot tub being emptied at a constant rate.

Graph A

Filling a Hot Tub

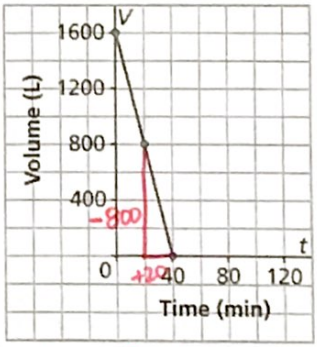


rate of change = $\frac{800\text{ L}}{40\text{ min}}$

= 20 L/min

Graph B

Emptying a Hot Tub



rate of change = $\frac{-800\text{ L}}{20\text{ min}}$

= −40 L/min