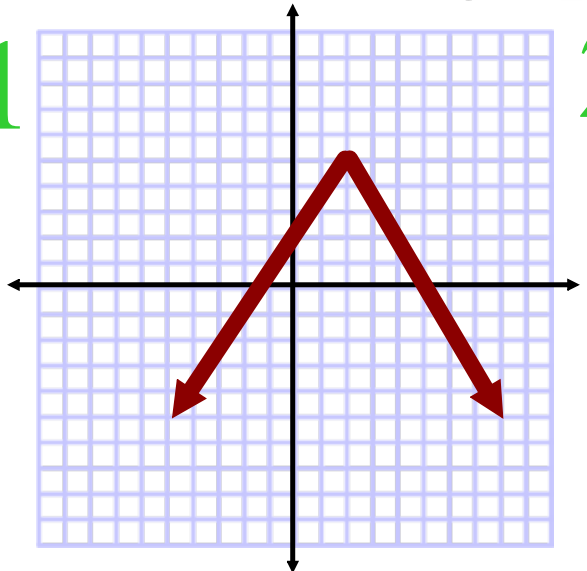
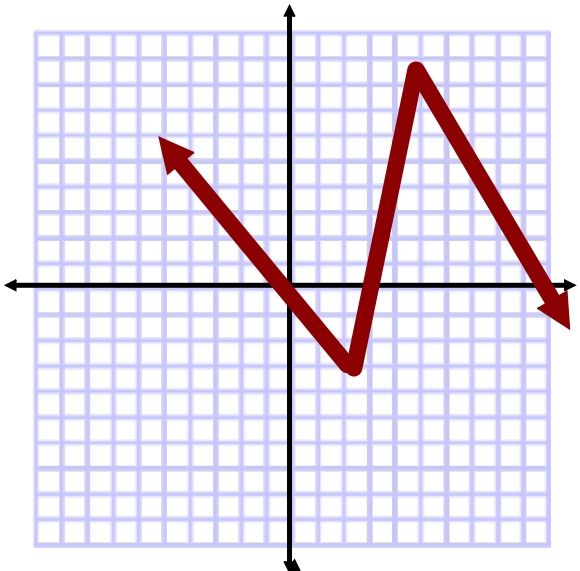
Properties of Linear Relations

Which graph is linear?

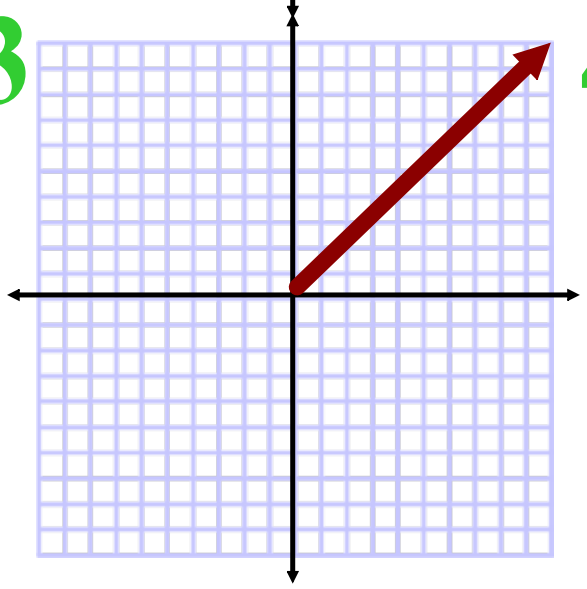
1



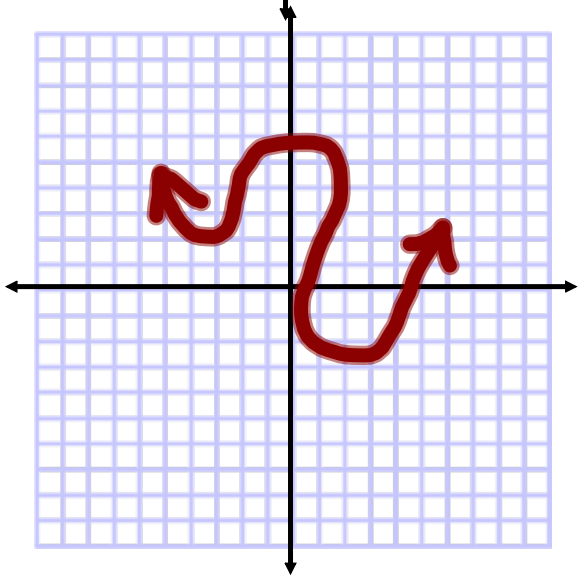
2



3



4



Number of Extra Toppings	Cost ($)
0	12.00
1	12.75
2	13.50
3	14.25
4	15.00
5	15.75

a) What patterns do you notice in the table above?

b) Graph the following relation.

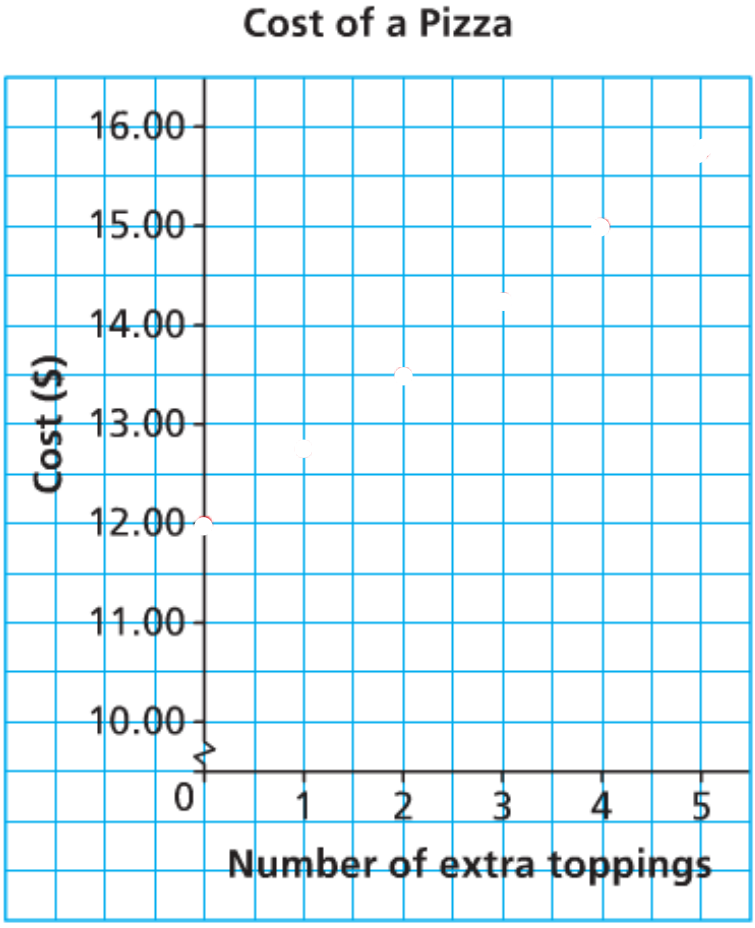
a)

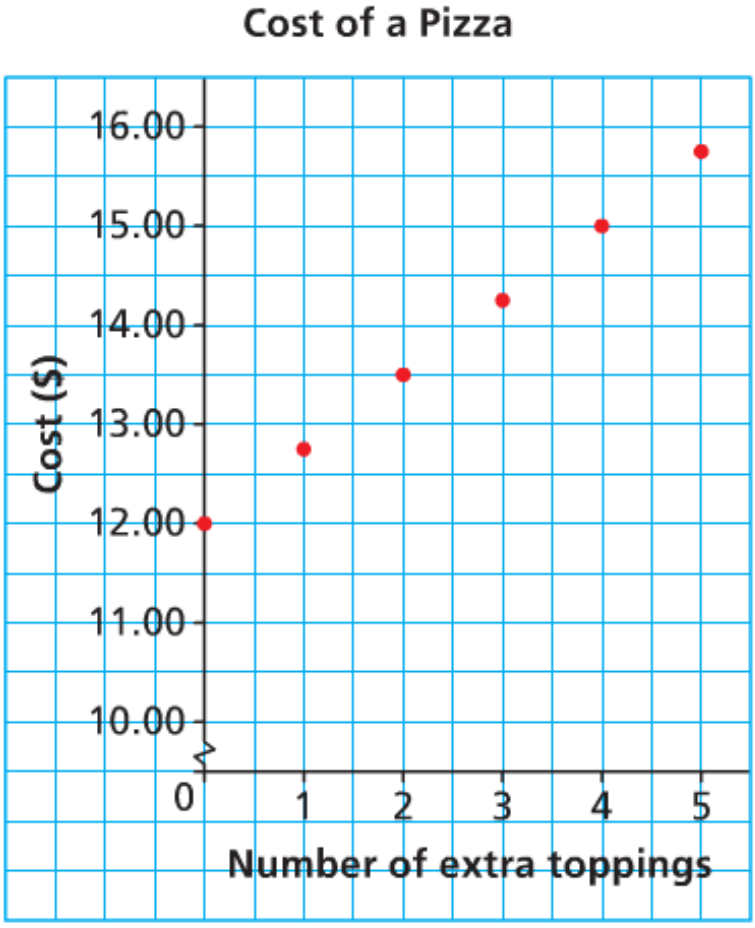
Number of Extra Toppings	Cost ($)	
0	12.00	
1	12.75	+0.75
2	13.50	+0.75
3	14.25	+0.75
4	15.00	+0.75
5	15.75	+0.75

+1 +1 +1 +1 +1

Both sets are increasing by a constant amount !!

Therefore, this is a linear function !!

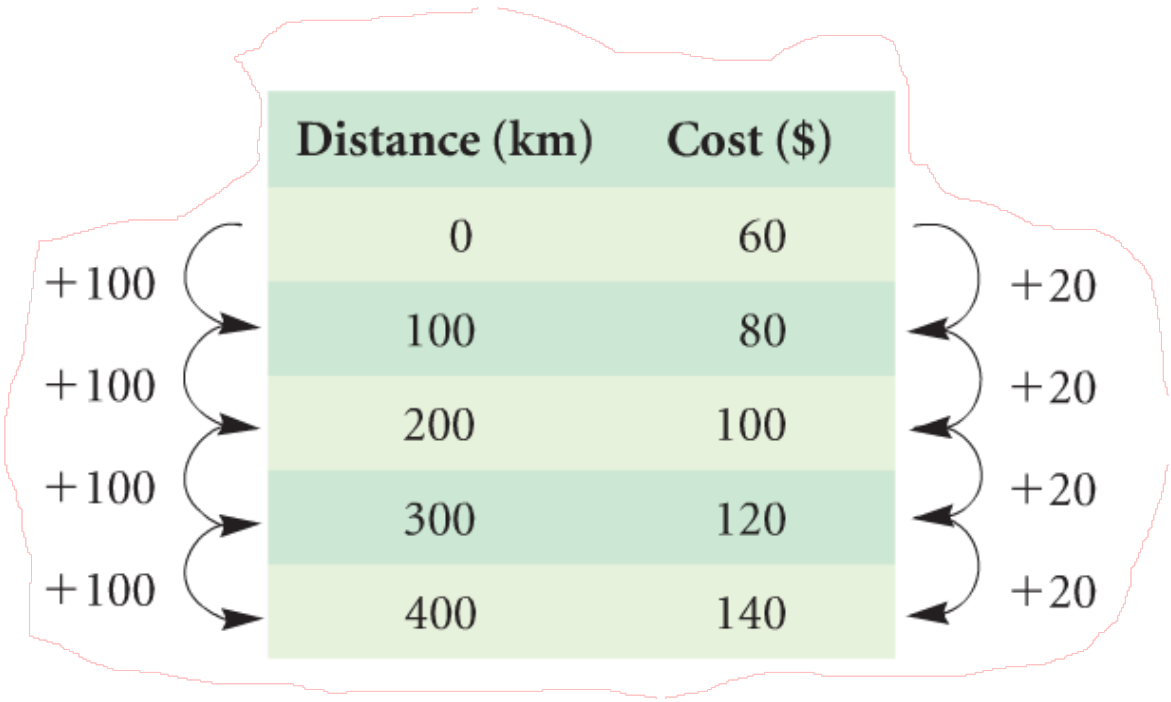

Cost of a Pizza
16.00
15.00
14.00
13.00
12.00
11.00
10.00
Cost ($)
0
1
2
3
4
5
Number of extra toppings


Cost of a Pizza
16.00
15.00
14.00
13.00
12.00
11.00
10.00
Cost ($)
0
1
2
3
4
5
Number of extra toppings

There are many ways to determine if a relation is a linear function!!

A table of values:

Distance (km)	Cost ($)
0	60
100	80
200	100
300	120
400	140

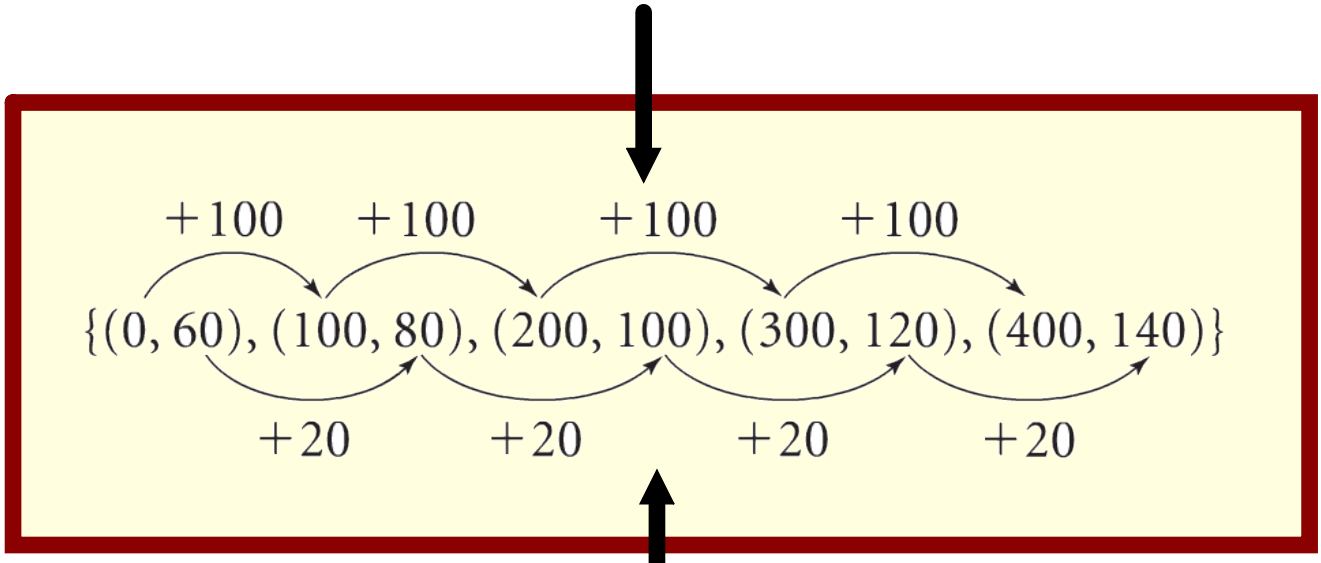


A constant change in the independent results in a constant change in the dependent

Set of Ordered Pairs:

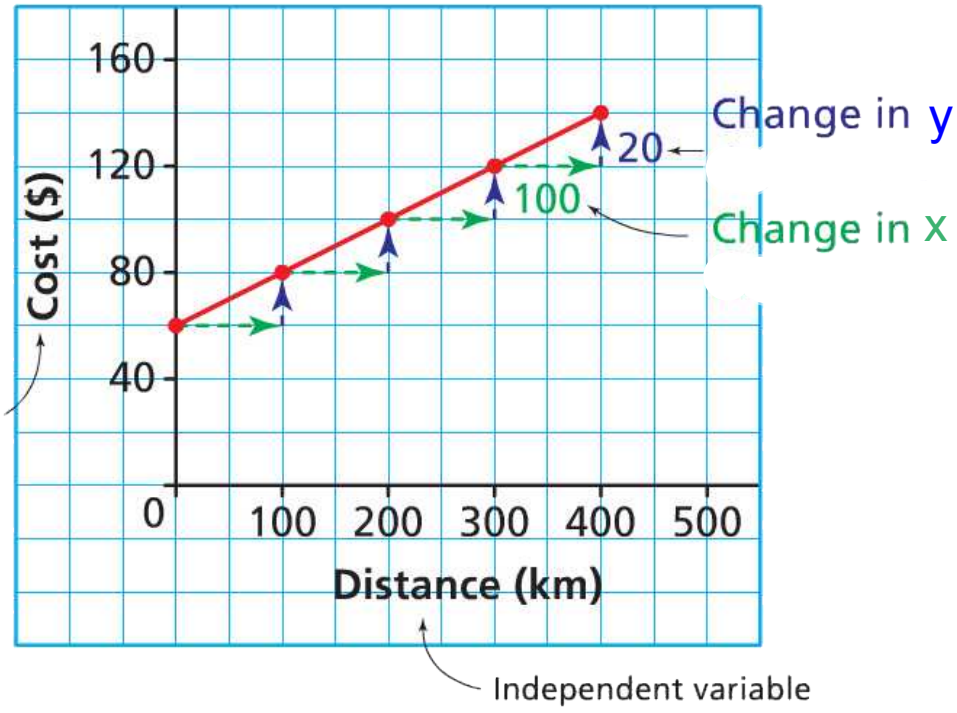
$$\{(0, 60), (100, 80), (200, 100), (300, 120), (400, 140)\}$$

Change in Independent



Change in Dependent

a graph:


160
120
80
40
0
Cost ($)
100
200
300
400
500
Distance (km)
Independent variable
20
100
Change in y
Change in x

Which of the following Represents a Linear Function?

a) The relation between temperature in degrees Celsius, C, and temperature in degrees Fahrenheit, F

C	F
0	32
5	41
10	50
15	59
20	68

b) The relation between the current, I amps, and power, P watts, in an electrical circuit

I	P
0	0
5	75
10	300
15	675
20	1200

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

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

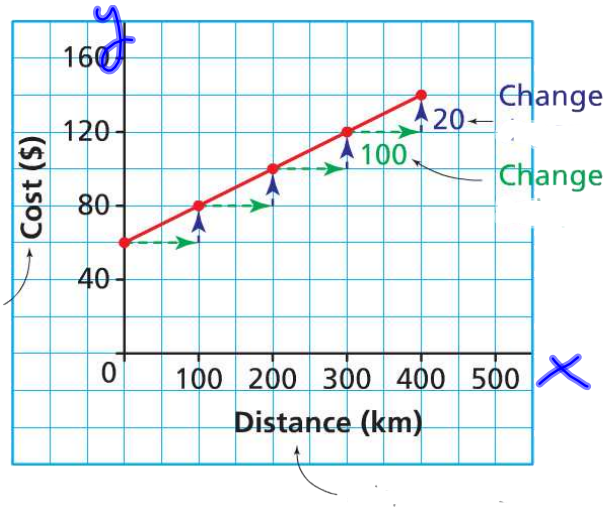
d) The relation between the amount of goods and services tax charged, T dollars, and the amount of the purchase, A dollars

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

Rate of Change

$$\text{Rate of Change} = \frac{\text{Change in } y}{\text{Change in } x}$$

$$\text{Slope "m"} = \frac{y_2 - y_1}{x_2 - x_1}$$

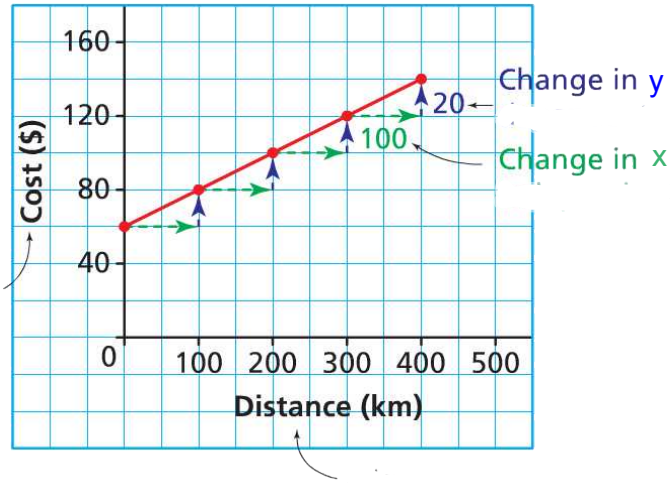


(960) (100, 80)

$$\text{Rate of Change} = \frac{\text{Change in y}}{\text{Change in x}}$$

$$= \frac{20}{100}$$

$$= 0.20/\text{km}$$



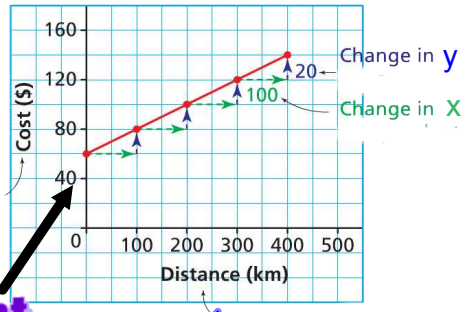
$$\text{Rate of Change} = \frac{\text{Change in y}}{\text{Change in x}}$$

$$= \frac{\$20}{100\text{km}}$$

$$= \$0.20/\text{km}$$

Writing an Equation

y=0.20x+60



initial amount

y = mx + b

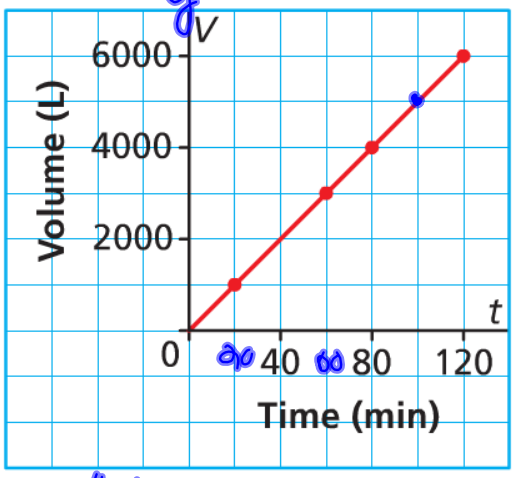
Initial amount

Rate of Change

Calculate the Rate of Change

a) Graph A

Filling a Water Tank

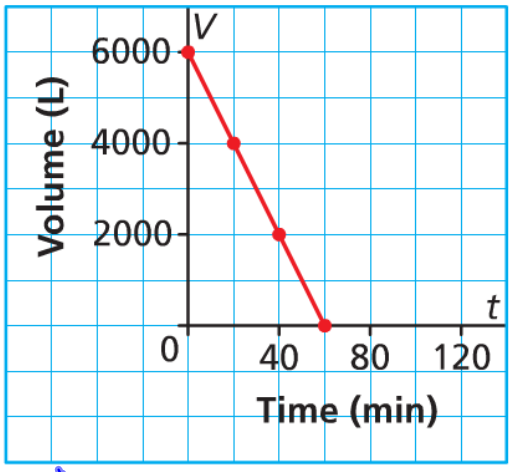


$\frac{\Delta y}{\Delta x} = \frac{2000\ L}{40\ min}$ $\frac{1000}{20}$

$= 50\ L/min$

b) Graph B

Emptying a Water Tank

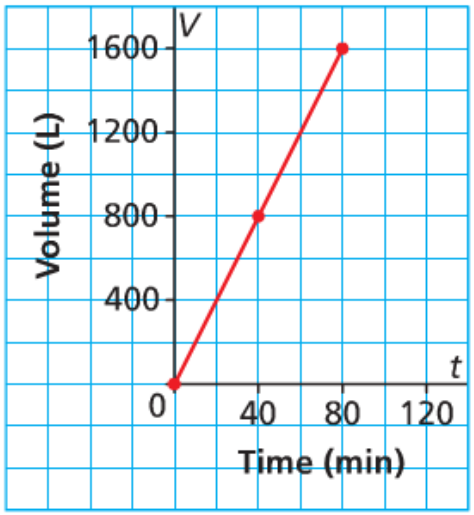


$\frac{\Delta y}{\Delta x} = \frac{-2000\ L}{20\ min}$

$-100\ L/min$

c)

Graph A
Filling a Hot Tub



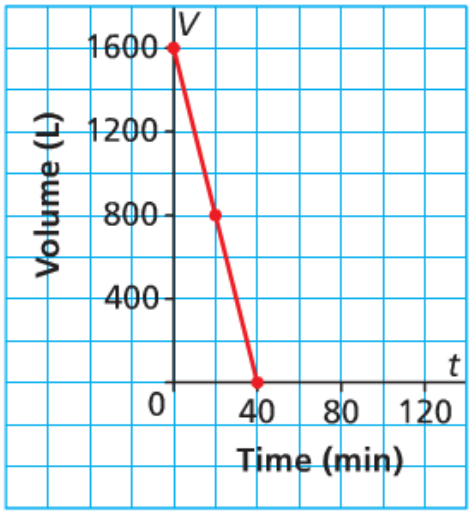
$\frac{\Delta y}{\Delta x} = \frac{800\text{L}}{40\text{ min.}}$

20L/min

$y = 20x + 0$

d)

Graph B
Emptying a Hot Tub



$\frac{\Delta y}{\Delta x} = \frac{-800\text{L}}{20\text{ min}}$

-40L/min

$y = -40x + 1600$

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