



$$1) \quad t(x) = 3x^2 + 5 \quad p(x) = \frac{-3x - 1}{2}$$

a) Evaluate
 $p(-5) \times t(4)$

b) Evaluate
 $p(t(-2))$

c) Evaluate
 $p(x) = -17$

d) Evaluate
 $t(x) = 113$

a) $p(x) = \frac{-3x - 1}{2}$
 $p(-5) = \frac{-3(-5) - 1}{2}$
 $= \frac{15 - 1}{2}$
 $= \frac{14}{2}$
 $\boxed{p(-5) = 7}$

$t(x) = 3x^2 + 5$
 $t(4) = 3(4)^2 + 5$
 $= 3 \cdot 16 + 5$
 $= 48 + 5$
 $\boxed{t(4) = 53}$

$p(-5) \times t(4)$
 7×53
 $\boxed{371}$

c) $p(x) = -17$
 $\cancel{p(x) = \frac{-3x - 1}{2}}$

$-3x - 1 = \cancel{-3x - 1} \times \cancel{x^2}$
 $-34 = -3x - 1 + 1$
 $\frac{-33}{-3} = \frac{-3x}{-3}$
 $\boxed{+11 = x}$

$p(t(-2))$
 $t(x) = 3x^2 + 5$
 $t(-2) = 3(-2)^2 + 5$
 $= 3 \cdot 4 + 5$
 $= 12 + 5$
 $\boxed{t(-2) = 17}$
 $p(x) = \frac{-3x - 1}{2}$
 $p(17) = \frac{-3(17) - 1}{2}$
 $= \frac{-51 - 1}{2}$
 $= \frac{-52}{2}$
 $\boxed{p(17) = -26}$
 $p(t(-2)) = -26$

$36 = x^2$
 $\sqrt{36} = \sqrt{x^2}$
 $\pm 6 = x$



The table of values and graph show the cost of a pizza with up to 5 extra toppings.

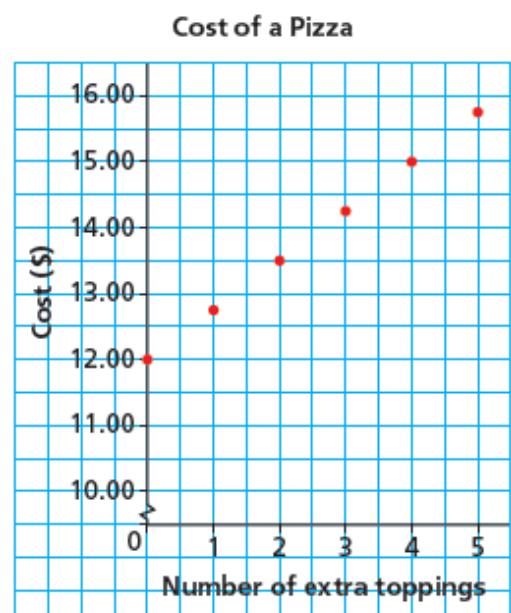
Number of Extra Toppings	Cost (\$)
0	12.00
1	12.75
2	13.50
3	14.25
4	15.00
5	15.75

What is the independent variable?
of Extra toppings (x)

What is the dependent variable ?
Cost (\$)
 y -axis



Graph



The cost for a car rental is \$60, plus \$20 for every 100 km driven.
 The independent variable is the _____ and the dependent variable
 is _____

count by 100s for independent "x"



We can identify that this is a linear relation in different ways.

Make
 a table of values

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

?

Graph is
 on 2 slides
 over

- a table of values

Independent variable →

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

← Dependent variable

Rate of Change



$$\text{rate of change} = \frac{\text{change in dependent variable } y}{\text{change in independent variable } x} = \frac{\text{rise}}{\text{run}} = \frac{\$20}{100 \text{ km}} = 0.2$$

Slope

Rate of change for this question is

$$\text{rate of change} = \frac{\Delta y}{\Delta x}$$

We can use each representation to calculate the rate of change.

- a graph



The rate of change can be expressed as a fraction:



$$\text{Rate of Change} = \frac{\text{change in dependent}}{\text{change in independent}} = \frac{\text{rise}}{\text{run}}$$



Th
re

The rate of change is \$0.20/km; that is, for each additional 1 km driven, the rental cost increases by 20¢. The rate of change is constant for a linear relation.

The cost of just renting a car is \$60.00

$$\frac{y \text{ cost}}{x \text{ dist}} = \frac{\$0.20}{100 \text{ km}} = \$0.2/\text{km}$$

$$y = \frac{0.20}{\text{rate of change}} x + \frac{60}{\text{initial cost or } \text{c}_0}$$

$$C(d) = 0.20d + 60$$

$$y = \frac{\text{rate of change}}{\text{slope}} x + y_{\text{intercept}}$$

$$y = mx + b$$

$$\text{slope } m = \text{rate of change} = \frac{\Delta y}{\Delta x}$$

$$b = y_{\text{intercept}}$$

Example 2**Determining whether an Equation Represents a Linear Relation**

a) Graph each equation.

i) $y = -3x + 25$

$$\begin{aligned} x=0 \\ -3(0) + 25 \\ \cancel{-3\cancel{(0)}} + 25 \\ = 25 \end{aligned}$$

$$\begin{aligned} x=1 \\ -3(1) + 25 \\ -3 + 25 \\ = 22 \end{aligned}$$

$$\begin{aligned} x=2 \\ -3(2) + 25 \\ -6 + 25 \\ = 19 \end{aligned}$$

$$\begin{aligned} x=3 \\ -3(3) + 25 \\ -9 + 25 \\ = 16 \end{aligned}$$

$$\begin{aligned} x=4 \\ -3(4) + 25 \\ -12 + 25 \\ = 13 \end{aligned}$$

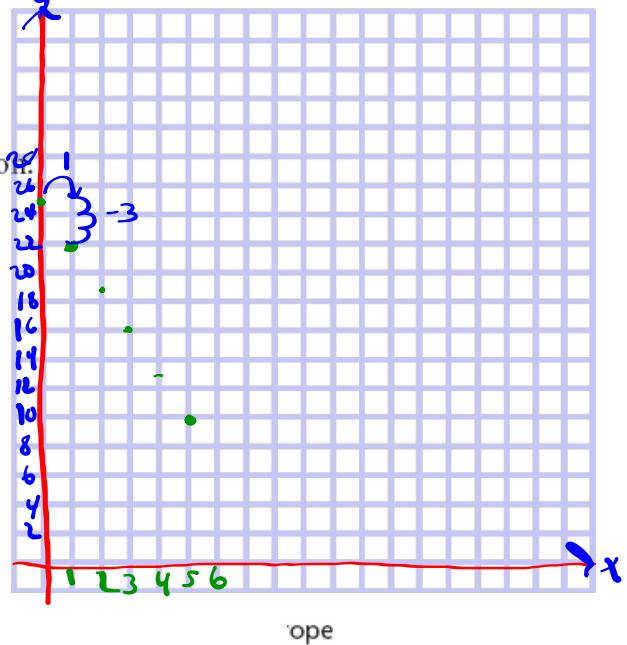
$$\begin{aligned} x=5 \\ -3(5) + 25 \\ -15 + 25 \\ = 10 \end{aligned}$$

SOLUTION

a) Create a table of values, then graph the relation.

x	y
0	25
1	22
2	19
3	16
4	13
5	10

graph



rate of change $\frac{\Delta y}{\Delta x}$

$$= \frac{-3}{1}$$

$$m = -3$$

$$b = 25$$

Example 2**Determining whether an Equation Represents a Linear Relation**

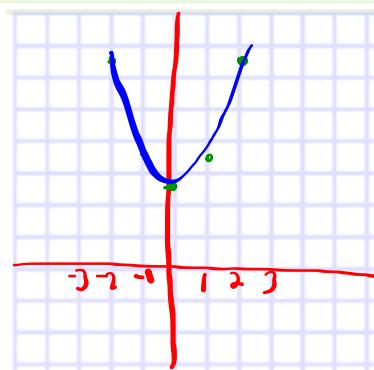
ii) $y = 2x^2 + 5$

x	y
-2	13
-1	7
0	5
1	7
2	13

graph

+1 ↗
+1 ↗
+1 ↗
Not linear
+ ↗
+ ↗
+ ↗

Not increasing at a constant rate



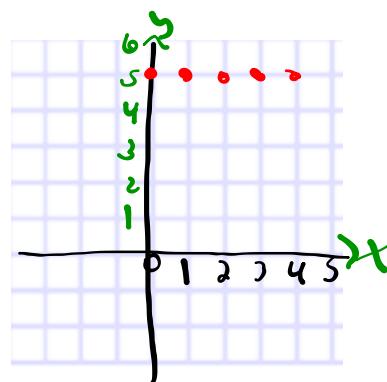
iii) $y = 5$ horizontal line

Linear

x	y
0	5
1	5
2	5

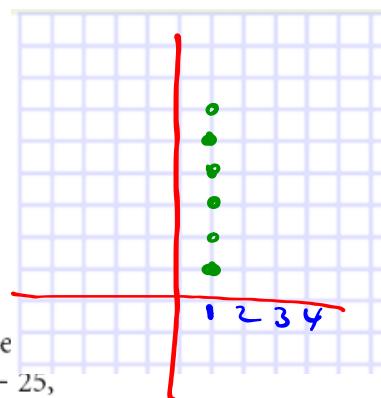
graph

times.



Example 2**Determining whether an Equation Represents a Linear Relation**iv) $x = 1$ *Vertical line* graph

x	y
1	-1
1	0
1	1

**NOTICE**

- b) The graphs in parts i, iii, and iv are straight lines, so the equations represent linear relations; that is, $y = -3x + 25$, $y = 5$, and $x = 1$.

The graph in part ii is not a straight line, so its equation does not represent a linear relation.

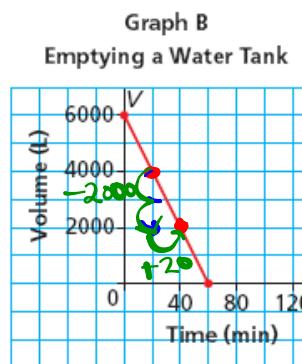
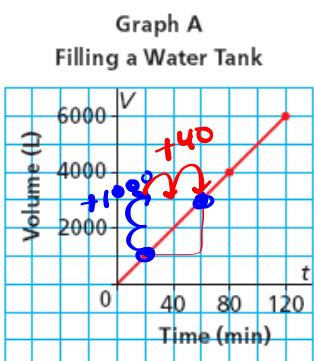


Example 4**Determining the Rate of Change of a Linear Relation from Its Graph**

A water tank on a farm near Swift Current, Saskatchewan, holds 6000 L.

Graph A represents the tank being filled at a constant rate.

Graph B represents the tank being emptied at a constant rate.



- a) Identify the independent and dependent variables.

*independent \rightarrow time
dependent \rightarrow Volume*

- b) Determine the rate of change of each relation, then describe what it represents.

Graph A

$$\text{Rate} = \frac{\Delta y}{\Delta x}$$

$$= \frac{+1000 \text{ L}}{+40 \text{ min}}$$

$$= 25 \text{ L/min}$$

Graph B

$$\text{Rate} = \frac{\Delta y}{\Delta x} \text{ L/min}$$

$$= \frac{-2000 \text{ L}}{+20 \text{ min}}$$

$$= -100 \text{ L/min}$$

Drained faster

