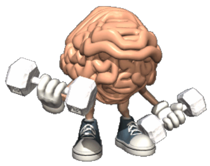
Warm Up



Test Wed May 16

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

$t(x) = 113$

a) Evaluate

p(-5) x t(4)

$\dfrac{-3(-5) - 1}{2}$ $\qquad$ $3(4)^2 + 5$, $3(16) + 5$, $48 + 5$, 53

$= \dfrac{15 - 1}{2}$

$\dfrac{14}{2}$

$= 7$

$\boxed{= 371}$

b) Evaluate

p(t(-2))

$t(x) = 3(x)^2 + 5$

$t(-2) = 3(-2)^2 + 5$

$= 3(4) + 5$

$= 12 + 5$

$= 17$

$p(17) = \dfrac{-3(x) - 1}{2}$

$= \dfrac{-3(17) - 1}{2}$

$= \dfrac{-51 - 1}{2}$

$= \dfrac{-52}{2}$

$\boxed{= -26}$

c) Evaluate

p(x) = -17

$p(x) = \dfrac{-3x - 1}{2}$

$-17^{\times 2} = \dfrac{-3x - 1}{2} \times 2$

$-34^{+1} = -3x - 1^{+1}$

$\dfrac{-33}{-3} = \dfrac{-3x}{-3}$

$\boxed{11 = x}$

d) Evaluate

t(x) = 113

$t(x) = 3x^2 + 5$

$113^{-5} = 3x^2 + 5^{-5}$

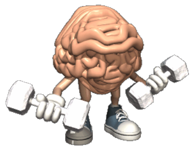
$\dfrac{108}{3} = \dfrac{3x^2}{3}$

$36 = x^2$

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

$\boxed{\pm 6 = x}$

Warm Up



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

a) Evaluate

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

Input

$p(x) = \dfrac{-3x-1}{2}$

$p(-5) = \dfrac{-3(-5)-1}{2}$

$\dfrac{+15-1}{2}$

$\dfrac{14}{2}$

$\boxed{p(-5) = 7}$

$t(x) = 3x^2+5$

$t(4) = 3(4)^2+5$

$3(16)+5$

$t(4) = 48+5$

$\boxed{t(4) = 53}$

$\underbrace{p(-5)}_{7} \times \underbrace{t(4)}_{53}$

$\boxed{=371}$

b) Evaluate

$p(t(-2))$

first

$t(x) = 3x^2+5$

$t(-2) = 3(-2)^2+5$

$= 3 \times 4 + 5$

$= 12 + 5$

$\boxed{t(-2) = 17}$

$p(t(-2))$

$p(17) = \dfrac{-3x-1}{2}$

$\dfrac{-3(17)-1}{2}$

$\dfrac{-51-1}{2}$

$-\dfrac{52}{2}$

$\boxed{p(t(-2)) = -26}$

c) Evaluate

$p(x) = -17$

d) Evaluate

$t(x) = 113$ output

$t(x) = 3x^2+5$

$113 = 3x^2+5$

$113-5 = 3x^2+5-5$

$108 = 3x^2$

$\dfrac{108}{3} = \dfrac{\cancel{3}x^2}{\cancel{3}}$

$36 = x^2$

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

$\boxed{\pm 6 = x}$

Homework Questions from

Page 281 #3,4,5,6,7,8,9

3a) F about 650 kg

3b) A 0.75 m

3c) D & E 400 kg

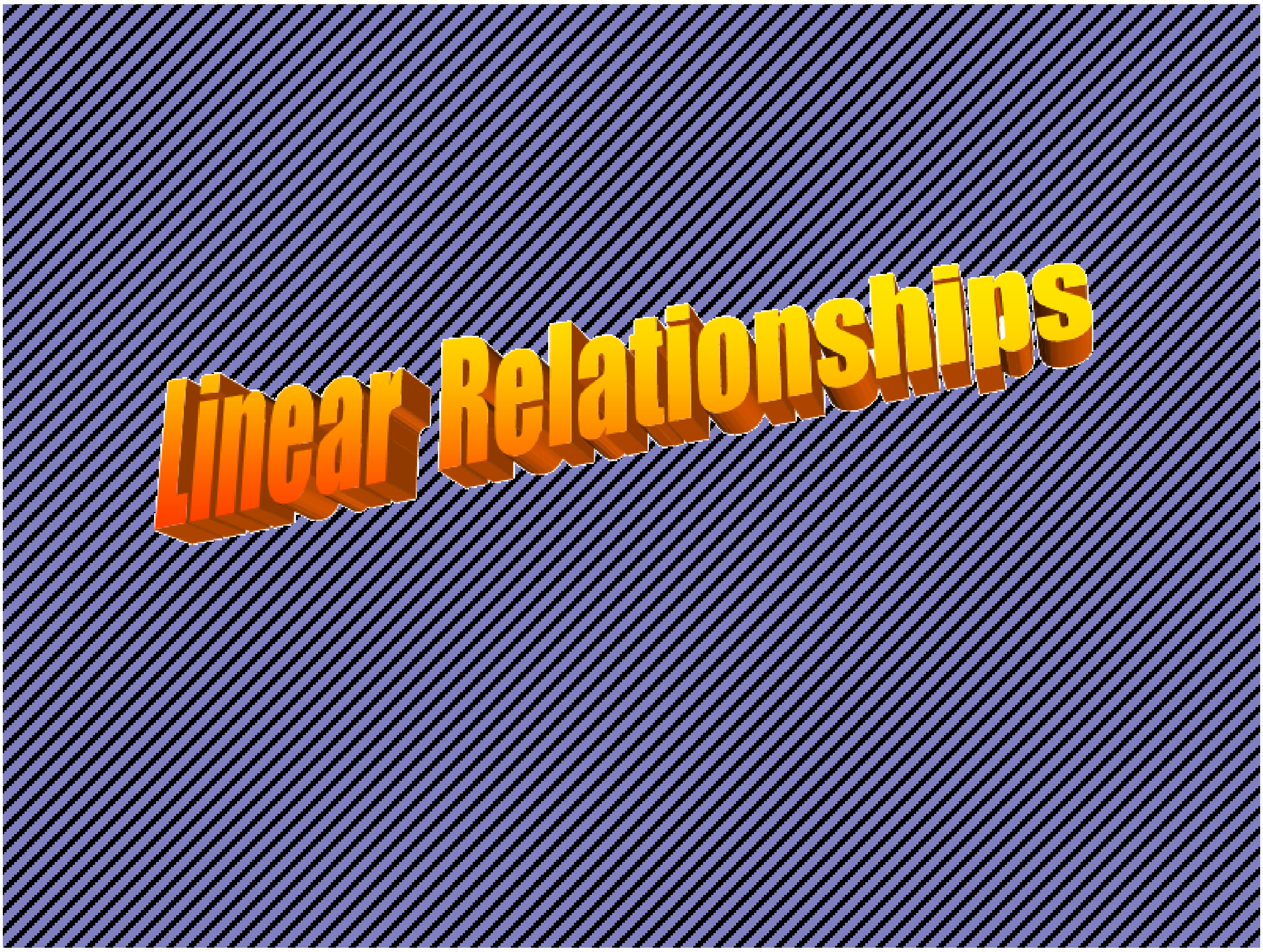
3d) D & H 2.25 m

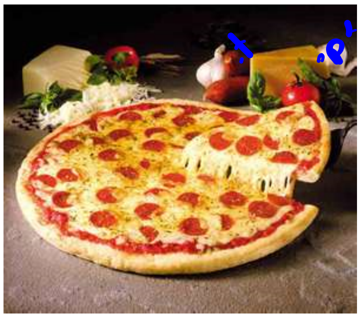
4) a) 8 m @ 6:00
18:00

b) 2 m @ 0:00
12:00
24:00

c) 4:00 it is 6.5 m

d) 4 m @ 2:00
≈ 8:45
14:15
≈ 21:45


Linear Relationships

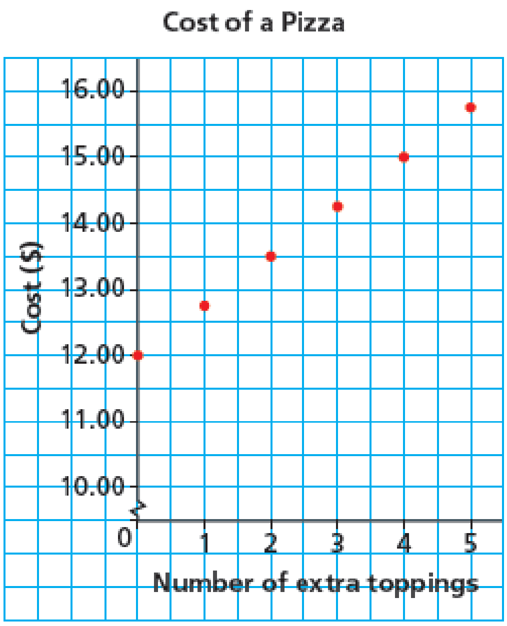


The table of values and graph show the cost of a pizza with up to 5 extra toppings.

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

$\frac{\Delta y}{\Delta x} = \frac{0.75}{1} =$

Graph



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

What is the dependent variable ? (y)
Cost

How to determine if a table is linear or non-linear

Check Rate of change

check to see if $\frac{\text{difference in f(x)}}{\text{difference in x}}$ gives same rate at every step

$= \frac{\Delta y}{\Delta x}$ ↕ ↔ $\frac{\text{rise}}{\text{run}}$ see a graph

a)

Δx	x	f(x)	$\Delta f(x)$
	0	21	
+14			+42
	14	63	
+7			+21
	21	84	
+14			+21
	35	105	

Table of point

$\frac{\Delta y}{\Delta x} = \frac{+42}{+14} = {+3}$

$\frac{\Delta y}{\Delta x} = \frac{21}{7} = 3$

$\frac{\Delta y}{\Delta x} = \frac{21}{14} = 1.5$

not all same

so Not linear

b)

Δx	x	f(x)	Δy
	6	10	
+5			+10
	11	20	
+5			+5
	16	25	
+5			+5
	21	30	

$\frac{\Delta y}{\Delta x} = \frac{10}{5} = 2$

$\frac{\Delta y}{\Delta x} = \frac{5}{5} = 1$

$\frac{\Delta y}{\Delta x} = \frac{5}{5} = 1$

not Same so non-linear

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

Make a table of values

Distance (km)	Cost ($)
0	
100	
200	
300	
400	

?

Graph is on 2 slides over

5.6 Properties of Linear Relations

- a table of values

Independent variable → | Distance (km) | Cost ($) | ← Dependent variable

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

+100 +100 +100 +100

+20 +20 +20 +20

$$\frac{\Delta y}{\Delta x} = \frac{20}{100} = 0.20$$

Rate of Change

Important

given a chart   given graph

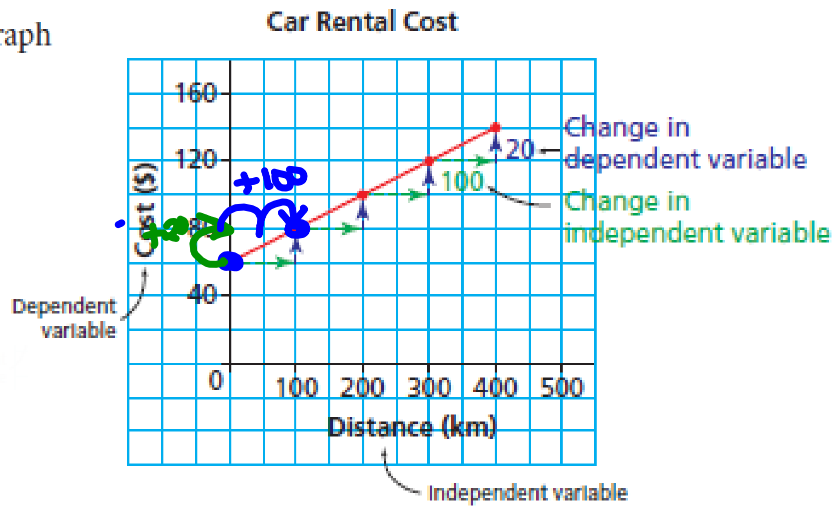
rate of change= $\dfrac{\text{change in dependent variable } (y)}{\text{change in independent variable } (x)}$ = $\dfrac{\text{rise}}{\text{run}}$ =

Rate of change for this question is

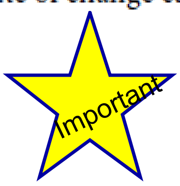
rate of change = $\dfrac{\Delta y}{\Delta x}$ =

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

- a graph



The rate of change can be expressed as a fraction:



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

Example 2 Determining whether an Equation Represents a Linear Relation

a) Graph each equation.

i) $y = -3x + 25$

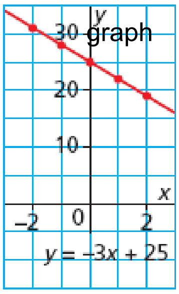
SOLUTION

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

i) $y = -3x + 25$

+1

x	y	
−2	31	
−1	28	−3
0	25	−3
1	22	−3
2	19	−3



ontinues.)

$\frac{\Delta y}{\Delta x} = \frac{-3}{1} = -3$

Example 2 Determining whether an Equation Represents a Linear Relation

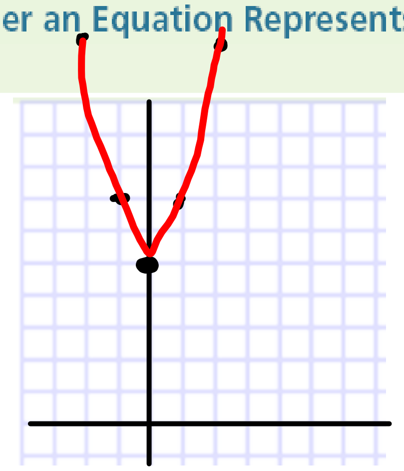
ii) $y = 2x^2 + 5$

x	y
−2	13
−1	7
0	5
1	7
2	13

+1

−6, −2, +2, +6

graph



iii) $y = 5$

x	y
0	5
1	5
2	5

+1, +1

0, 0

graph

$\frac{0}{1} = \frac{\Delta y}{\Delta x}$

$0 =$

Example 2 Determining whether an Equation Represents a Linear Relation

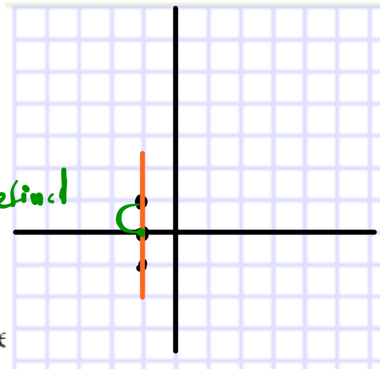
iv) $x = 1$

graph

x	y
1	−1
1	0
1	1

$\frac{rise}{run} = \frac{1}{0}$

= undefined



NOTICE

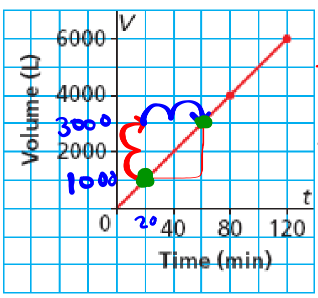
b) The graphs in parts i, iii, and iv are straight lines, so the equations represent linear relations; that is, $y = -3x + 25$, $y = 5$, and $x = 1$.
The graph in part ii is not a straight line, so its equation does not represent a linear relation.

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.

$\frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x}$

Graph A
Filling a Water Tank

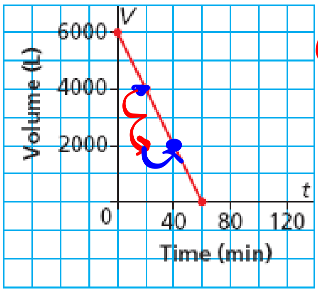


$\frac{\text{rise}}{\text{run}} = \frac{+2000\,L}{+40\,min}$

divide out

$\boxed{\text{rate} = 50\,L/min}$

Graph B
Emptying a Water Tank



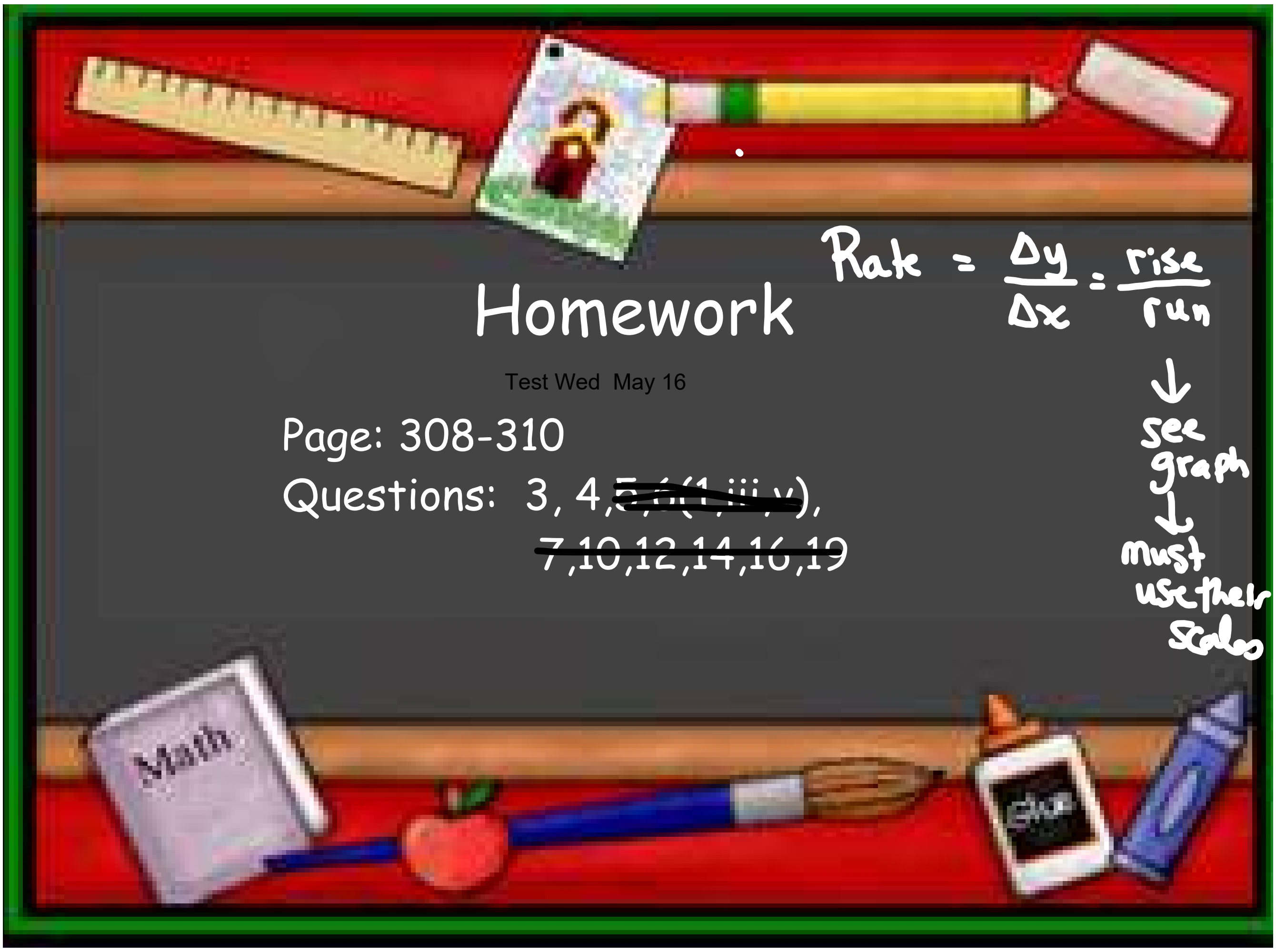
$\text{rise} = \frac{-2000\,L}{+20\,min}$

$= \boxed{100\,L/min}$

a) Identify the independent and dependent variables.

Time (min) Volume (L)

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


Homework
Test Wed May 16
Page: 308-310
Questions: 3, 4, ~~5,6(i,iii,v)~~,
~~7,10,12,14,16,19~~
Rate = $\frac{\Delta y}{\Delta x}$ = $\frac{rise}{run}$
↓
see graph
↓
must use their scales
Math
Glue

pg 308 - 310
3, # 4

3a)

Time (min)	Distance (m)
0	10
2	50
4	90
6	130

+2, +2, +2

+40, +40, +40

$rate = \frac{\Delta y}{\Delta x} = \frac{40m}{2min} = 20m/min$

divide

Same

Same

all Same

then linear

3b)

Time (s)	Speed (m/s)
0	10
1	20
2	40
3	80

+1, +1

+10, +20

$rate = \frac{\Delta y}{\Delta x} = \frac{10\ m/s}{+1\ s} = 10\ m/s^2$

$rate = \frac{\Delta y}{\Delta x} = \frac{+20\ m/s}{1\ s} = 20\ m/s^2$

Not same so Not linear