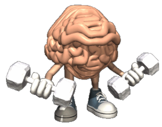
Warm Up



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

a) Evaluate
p(-5) x t(4)

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

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

$p(-5) = \dfrac{15-1}{2}$

$p(-5) = \dfrac{14}{2}$

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

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

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

$= 3(16) + 5$

$= 48 + 5$

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

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

7×53

371

b) Evaluate
p(t(-2))

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

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

$3(4) + 5$

$12 + 5$

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

$p(t(-2))$

$p(17)$

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

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

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

$\dfrac{-52}{2}$

$\boxed{p(17) = -26}$

$p(t(-2)) = -26$

c) Evaluate
p(x) = -17

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

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

Solve for "x" (Isolate)

$2 \cdot -17 = \dfrac{-3x-1}{\cancel{2}} \cancel{\cdot 2}$

$-34 = -3x - 1$

$-34 + 1 = -3x \cancel{-1 + 1}$

$-33 = -3x$

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

$\boxed{11 = x}$

d) Evaluate
t(x) = 113

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

$113 = 3x^2 + 5$

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

$108 = 3x^2$

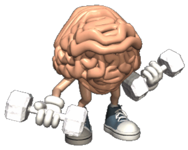
$\dfrac{108}{3} = \dfrac{\cancel{3}x^2}{\cancel{3}}$

$36 = x^2$

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

$\pm 6 = x$

Warm Up



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

a) Evaluate

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

Input

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

$p(\underbrace{t(-2)}_{\text{first}})$

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

$t(-2) = 3\underbrace{(-2)^2}_{} + 5$

$= \underbrace{3 \times 4}_{} + 5$

$= 12 + 5$

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

$p(t(-2))$

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

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

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

$\dfrac{-52}{2}$

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

c) Evaluate

$p(x) = -17$

d) Evaluate

$t(x) = 113$ output

$\underbrace{t(x)}_{} = 3x^2 + 5$

$113 = 3x^2 + 5$

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

$108 = 3x^2$

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

$36 = x^2$

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

$\boxed{\pm 6 = x}$

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

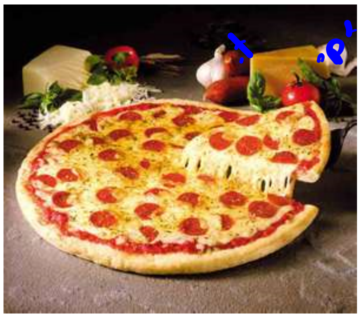
4) a) 8 m @ 6:00
18:00

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.

x Independent — y dependent

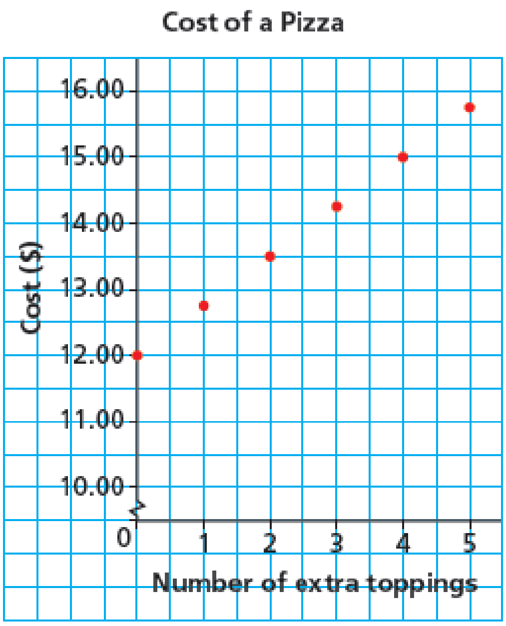
Number of Extra Toppings	Cost ($)
0	12.00
1	12.75
2	13.50
3	14.25
4	15.00
5	15.75

+1   1   +0.75   0.75

What is the independent variable?
The # of extra topping

What is the dependent variable ?
Cost of pizza

Graph



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

Check Rate of change

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

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

a)

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

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

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

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

the rate of change is Not equal

Non-linear

b)

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

$\frac{\Delta y}{\Delta x}$

$\frac{+10}{+5} = +2$

$\frac{+5}{+5} = 1$

Rate of chang diffe 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) ; Dependent variable → (Cost)

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

100, 100, 100, 100

20, 20, 20, 20

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

$= 0.2$

All the same Rates of change So linear

Rate of Change

Important

given a chart

given graph

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

Rate of change for this question is

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

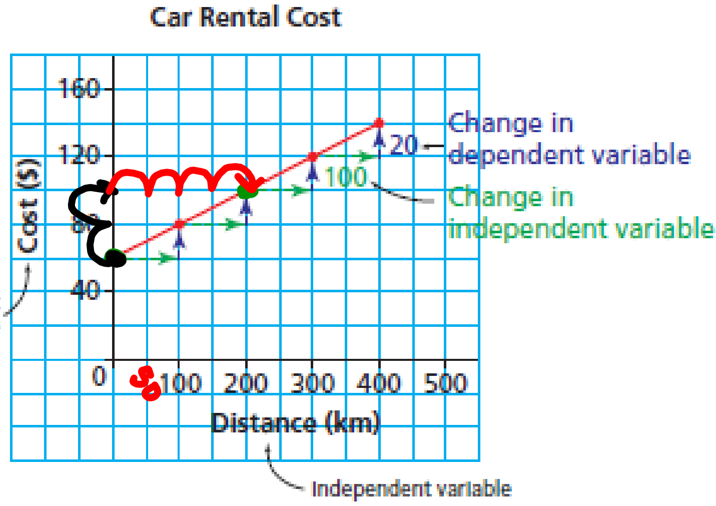
We can use each representation to calculate the **rate of change**.

- a graph

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

$= \frac{+40}{+200}$

$= 0.2$



The rate of change can be expressed as a fraction:

Important

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

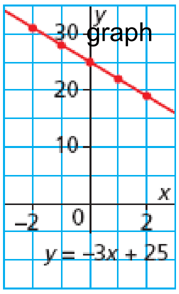
a) Create a table of values, then graph the relation.

i) $y = -3x + 25$

Δx +1

x	y
−2	31
−1	28
0	25
1	22
2	19

Δy −3



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

ɔntinues.)

Example 2 Determining whether an Equation Represents a Linear Relation

Rules are different → Non-linear

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

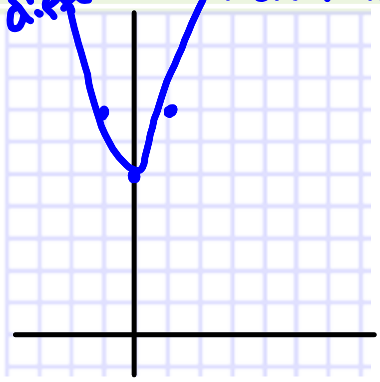
graph

x	y
−2	13
−1	7
0	5
1	7
2	13

+1 -6 -2 +2 +6

$\frac{\Delta y}{\Delta x}$ $\frac{-6}{+1} = -6$

$\frac{-2}{+1} = -2$



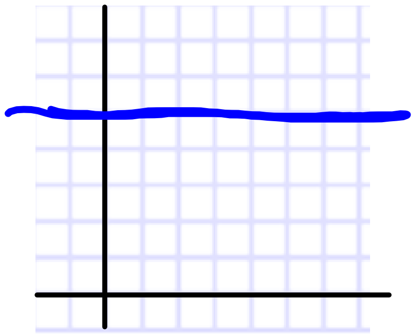
iii) $y = 5$

grapl

x	y
0	5
1	5
2	5

1 1 0 0

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



horizontal line

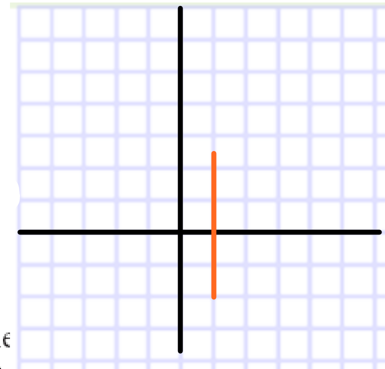
Example 2 Determining whether an Equation Represents a Linear Relation

iv) $x = 1$ vertical line

graph

	x	y	
	1	−1	
0	1	0	+1
0	1	1	+1

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



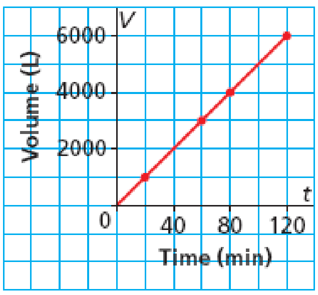
NOTICE

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.

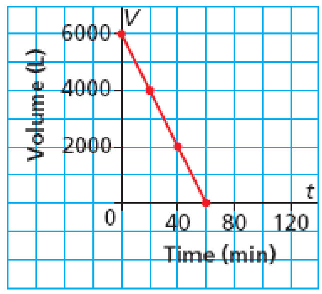
Example 4 Determining the Rate of Change of a Linear Relation from Its Graph

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.

Graph A
Filling a Water Tank

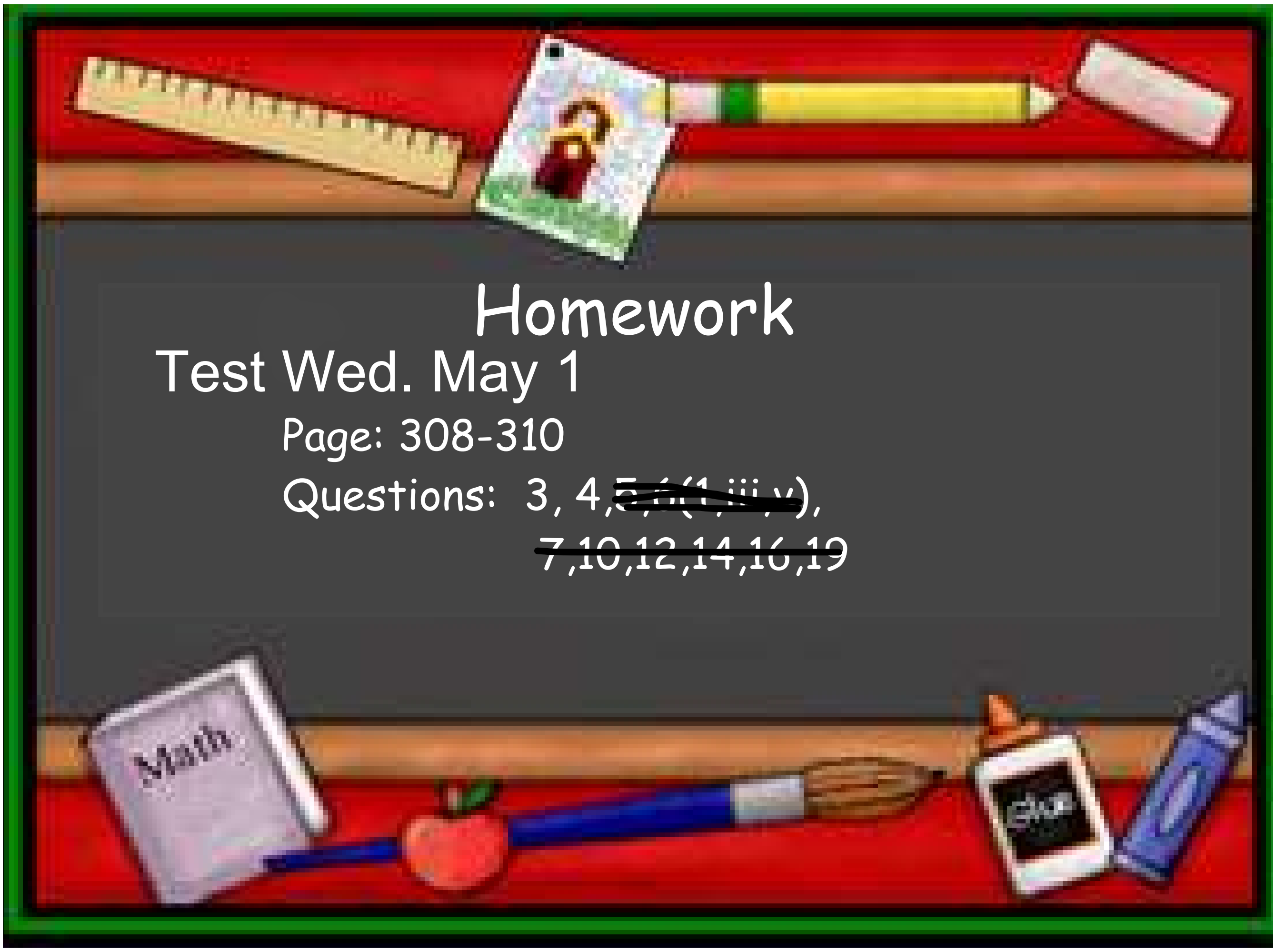


Graph B
Emptying a Water Tank



a) Identify the independent and dependent variables.

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


Homework
Test Wed. May 1
Page: 308-310
Questions: 3, 4,~~5,6(1,iii,v)~~,
~~7,10,12,14,16,19~~
Math

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