

## Chapter 5 Exam Review

MPM1D

Jensen

Constant of variation =

$$\frac{\Delta \text{dependent}}{\Delta \text{independent}}$$

### Section 1: 5.1 Direct Variation

1. Find the constant of variation for each direct variation.

a) The distance travelled by a car varies directly with time. The car travels 270 km in 3 hours.

$$m = \frac{270}{3}$$
$$= 90$$

~~b) The distance travelled on a trip varies directly with the amount of gas used. A car travelled 375 km and used 25 litres of gas.~~ The cost of renting a car varies directly with the time you rent it for.

The cost of renting a car for 3 days is \$150.

$$m = \frac{150}{3}$$
$$= 50$$

The money earned by an employee varies directly with time. The employee earned \$320 in 40 hours.

$$m = \frac{320}{40}$$
$$= 8$$

d) The cost of a phone call varies directly with time. A 20 minute phone call costs \$2.00.

$$m = \frac{2}{20}$$
$$= 0.1$$

2. The cost,  $C$ , in dollars, of building a patio varies directly with its width,  $w$ , in meters.

a) Find an equation relating  $C$  and  $w$  if the cost of building a patio with a width of 4 meters is \$300.

$$m = \frac{300}{4}$$

$$m = 75$$

$$C = 75w$$

b) What does the constant of variation represent?

The cost per 1m of width of the patio

c) Use the equation to determine the cost of a patio with a width of 7 meters.

$$C = 75(7)$$

$$C = 525$$

\$525

3. The following table shows the cost of potatoes based on the weight, in kilograms.

a) Is this an example of direct or partial variation?

direct

b) What is the constant of variation?

$$m = 2.18$$

Weight (kg)	Cost (\$)
0	0
1	2.18
2	4.36
3	6.54

c) What does the constant of variation represent?

cost per kg of potatoes

d) Write an equation for the relationship

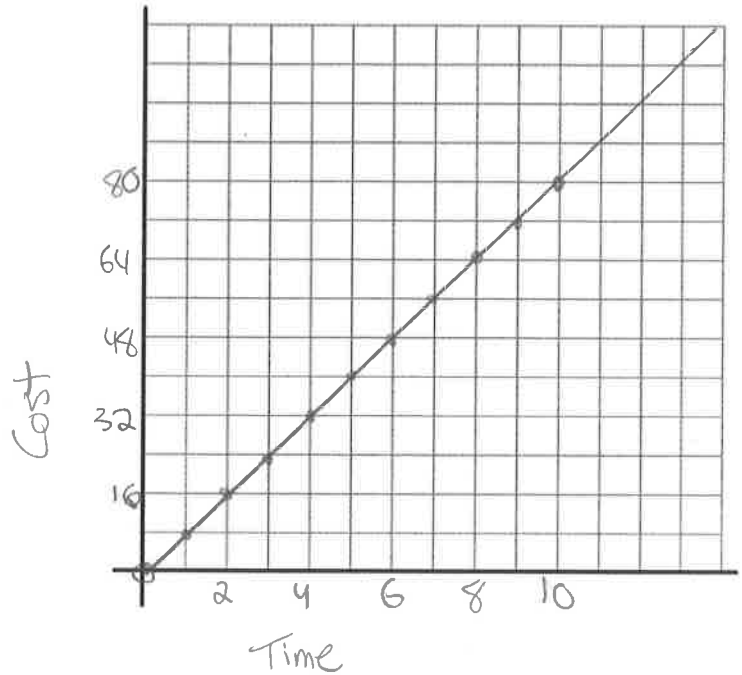
$$y = 2.18x$$

4. A rental agency charges \$8 per hour to rent a canoe.

a) Complete the following table of values

Time (hours)	Cost (\$)
0	0
2	16
4	32
6	48
8	64
10	80

b) Graph the relationship (label the axes)



c) Write an equation for the relationship between the cost of renting a canoe and the time you rent it for.

$$y = 8x$$

d) Use your equation to calculate the cost of renting a canoe for two full days.

$$y = 8(48)$$

$$y = 384$$

\$384

5. The volume of water in a water tank varies directly with time. The tank contains 200 L of water after 2 minutes.

an equation

a) Write an equation relating the volume of water and time. What does the constant of variation represent?

$$m = \frac{200}{2} \\ = 100$$

$$y = 100x$$

The constant of variation represents the amount of water added per minute.

b) What volume of water is in the tank after 30 minutes?

$$y = 100(30) \\ y = 3000 \text{ L}$$

c) How long will it take to fill a water tank that can hold 100 000 L of water?

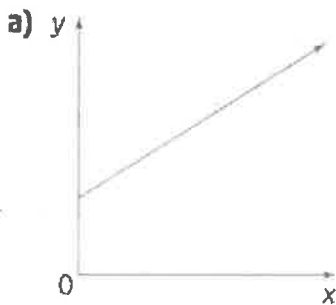
$$100\,000 = 100x$$

$$1000 = x$$

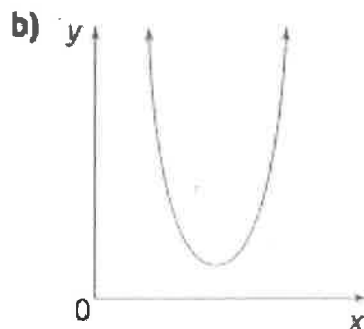
1000 minutes

## Section 2: Partial Variation

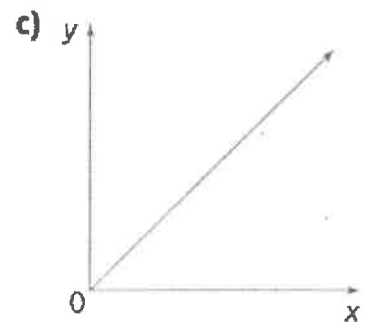
6. Classify each of the following graphs as direct variation, partial variation, or neither.



Partial



Neither



Direct

7. Identify each of the following relations as direct variation, partial variation, or neither.

a)  $y = 10x$

direct

b)  $C = 4t + 3$

partial

c)  $y = 3x + 2$

partial

d)  $d = 3t$

direct

8. a) Copy and complete the table of values given that  $y$  varies partially with  $x$ .

$x$	$y$
0	4
1	7
2	10
3	13
4	16
7	25

b) What is the initial value (y-intercept)?

$$b = 4$$

c) What is the constant of variation (slope)?

$$m = \frac{7-4}{1-0} = \frac{3}{1}$$

$$m = 3$$

d) Write an equation for the relationship in the for  $y = mx + b$ .

$$y = 3x + 4$$

9. A charitable organization is planning to rent a hall for a fundraiser. The cost of renting the hall is \$200. There is an additional cost of \$3 for each person attending the fundraiser for the entrance fee.

a) Identify the fixed cost and the variable cost of this partial variation.

Fixed cost  
 $b = 200$

variable cost  
 $m = 3$

b) Write an equation relating the cost,  $C$ , in dollars, and the number of people  $n$ .

$$C = 3n + 200$$

Use your equation to determine the total cost is 100 people attend the fundraiser.

$$C = 3(100) + 200$$

$$C = 500$$

\$500

10. This table shows the amount a printing company charges to print a newsletter.

- a) Identify the fixed cost this company charges to print the newsletter.  
What do you think this amount might represent?

$$b = 50$$

- b) Determine the variable cost of printing one newsletter.  
(constant of variation)

$$m = \frac{450 - 50}{200 - 0} = \frac{400}{200} = 2 \quad m = 2$$

- c) Write an equation representing the price to print newsletters.

$$C = 2n + 50$$

Number of newsletters, $n$	Cost, $C$ (\$)
0	50
200	450
400	850
600	1250
800	1650
1000	2050

- d) What is the cost to print 1200 newsletters?

$$C = 2(1200) + 50$$

$$C = 2450$$

\$2450

- e) How many newsletters can be printed for \$300.

$$300 = 2n + 50$$

$$250 = 2n$$

$$125 = n$$

125 newsletters

11. A fitness club offers two types of monthly memberships:

**Membership A:** \$3 per visit

**Membership B:** A flat fee of \$8 and \$2 per visit

- a) Classify each relation as a direct variation or a partial variation.

A: Direct

B: Partial

b) Write an equation relating the cost and the number of visits for each membership.

$$A: C = 3n$$

$$B: C = 2n + 8$$

Compare the monthly membership costs. When is Membership A cheaper than Membership B? When is Membership B cheaper than Membership A?

If you go to the gym 7 times a month, which Plan should you choose?

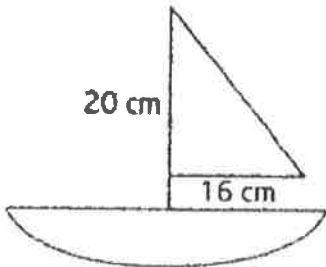
$$A: C = 3(7) \\ = 21$$

$$B: C = 2(7) + 8 \\ = 14 + 8 \\ = 22$$

Plan A is \$1 cheaper

### Section 3: 5.3 Slope

12. Find the slope of the sail on the toy sailboat

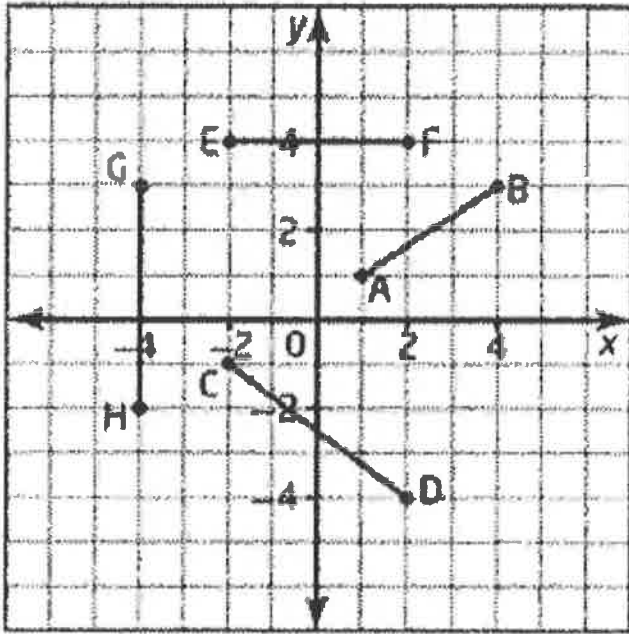


$$m = \frac{\text{rise}}{\text{run}} \\ = \frac{-20}{16} \\ = -1.25$$

13. A set of stairs is to be built so that each step has a vertical <sup>rise</sup> of 20 cm over a horizontal run of 27.5 cm. Find the slope, to the nearest hundredth.

$$m = \frac{20}{27.5} \\ = 0.73$$

14. Find the slope of each line



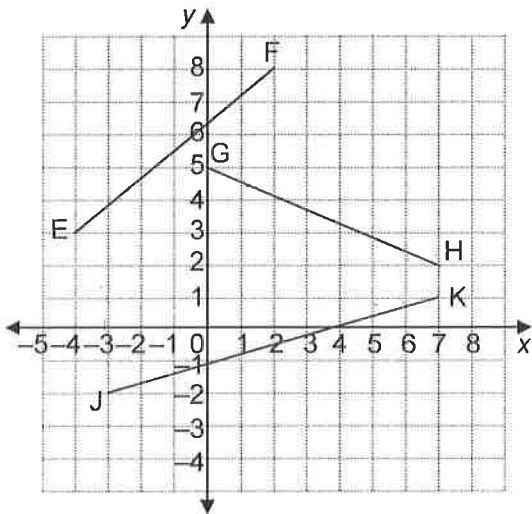
AB:  $m = \frac{1}{3}$

CD:  $m = \frac{-3}{4}$

EF:  $m = 0$

GH: undefined

15. Find the slope of each line



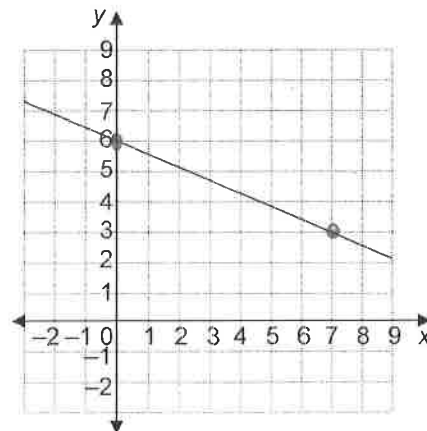
EF:  $m = \frac{5}{6}$

GH:  $m = \frac{-3}{7}$

JK:  $m = \frac{3}{10}$

16. Find the slope of the following line:

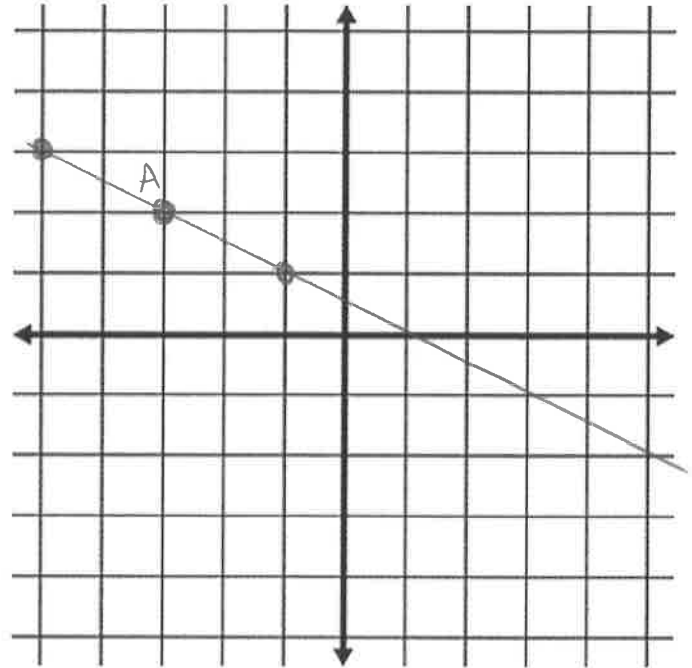
$m = \frac{-3}{7}$





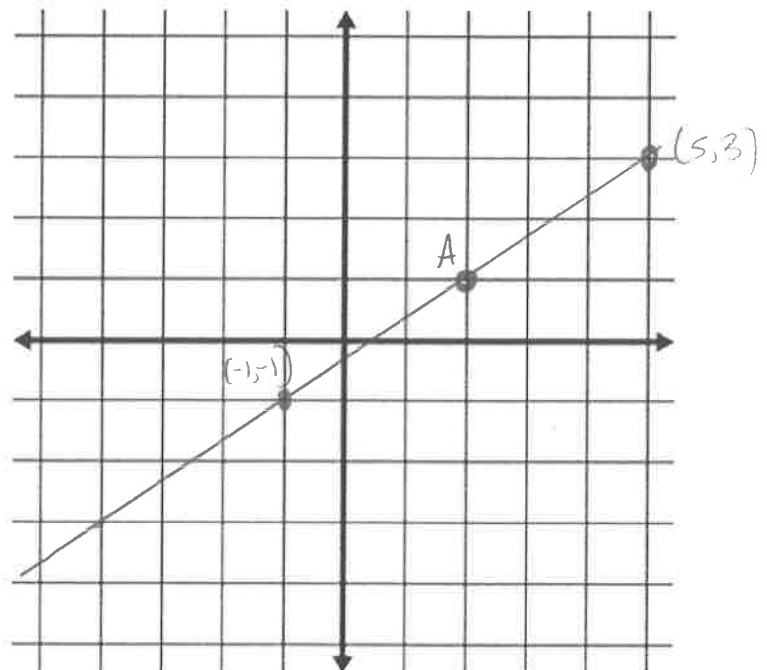
17. A line segment has one endpoint of  $A(-3,2)$  and a slope of  $-\frac{1}{2}$ . Find the coordinates of a point to left and to the right of A. Use the graph to help and then record the new coordinates in the table of values.

$x$	$y$
-1	1
-3	2
-5	3



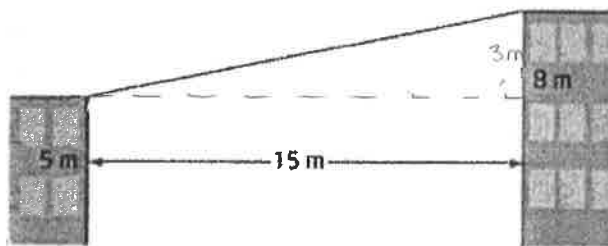
18. A line segment has one endpoint of  $A(2,1)$  and a slope of  $\frac{2}{3}$ . Find the coordinates of a point to left and to the right of A. Use the graph to help and then record the new coordinates in the table of values.

$x$	$y$
-1	-1
2	1
5	3



19. A steel wire goes between the tops of two walls that are 15 meters apart. One wall is 8 meters high. The other is 5 m high. What is the slope of the steel wire?

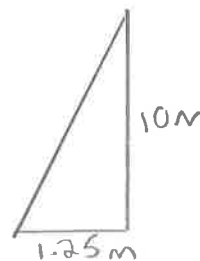
$$m = \frac{\text{rise}}{\text{run}}$$
$$= \frac{3}{15}$$
$$= 0.2$$



20. A ladder is leaning up against a wall of a building so that it reaches 10 m up the wall. The bottom of the ladder is 1.25 m from the base of the wall.

a) What is the slope of the ladder?

$$m = \frac{10}{1.25}$$
$$= 8$$



b) Has the ladder been placed according to the safety standards, which state that the ladder should have a slope of between 6.3 and 9.5 when it is placed up against a building?

Yes.

#### Section 4: 5.4 Slope as a Rate of Change

21. A heron can travel an average of 400 km in 10 hours. What is the rate of change of distance?

$$m = \frac{400}{10}$$
$$= 40 \text{ km/h}$$

22. A small bird can flap its wings 120 times in 30 seconds. What is the rate of change of wing flaps?

$$m = \frac{120}{30}$$

$$= 4 \text{ flaps/sec.}$$

23. The average resting adult heart beats 720 times in 10 minutes. What is the rate of change of heart beats?

$$m = \frac{720}{10}$$

$$= 72 \text{ bpm}$$

24. This graph shows the height above the ground of a skier over time.

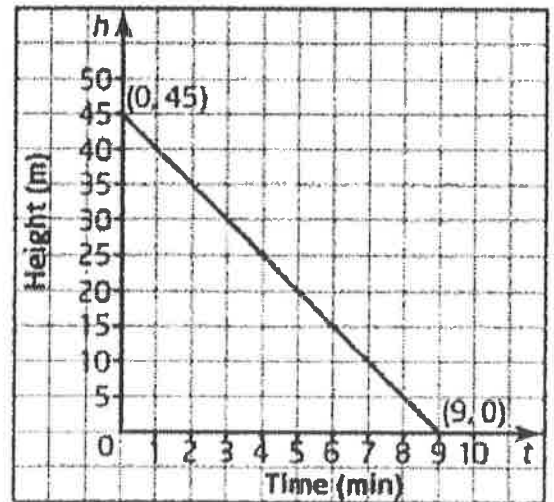
a) Calculate the slope of the graph?

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

$$= \frac{0 - 45}{9 - 0}$$

$$= \frac{-45}{9}$$

$$= -5$$



b) Interpret the slope as a rate of change

$-5 \text{ m/min.}$  The height decreases by 5m every minute.

25. The price of a litre of milk increased from \$1.25 in 2004 to \$1.35 in 2006. What is the average price increase per year?

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

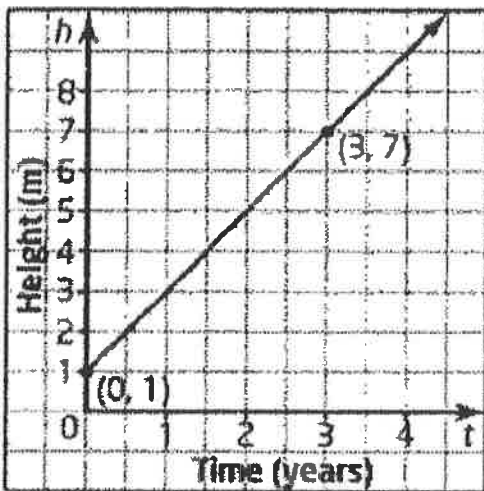
$$= \frac{1.35 - 1.25}{2006 - 2004}$$

$$= \frac{0.1}{2}$$

$$= 0.05$$

\$0.05 per year.

26. This graph shows the height of a tree over a 5-year growing period. Calculate the rate of change of height per year.



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

$$= \frac{7 - 1}{3 - 0}$$

$$= \frac{6}{3}$$

$$= 2$$

2m/year.

27. This distance-time graph shows two cyclists that are travelling at the same time.

a) Which cyclist has the greater speed and by how much?

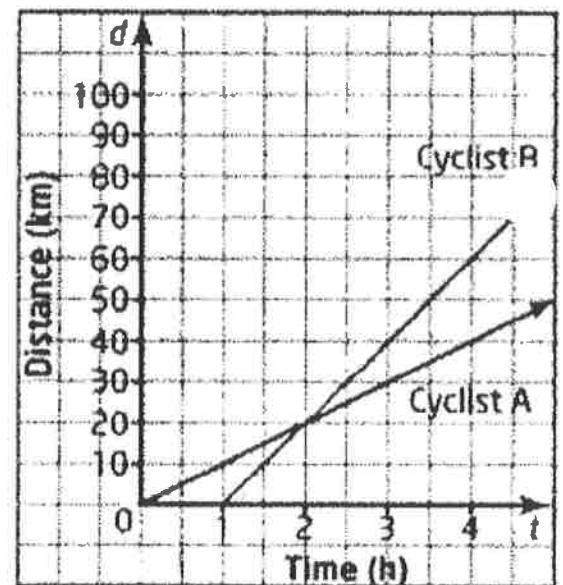
$$B: m = \frac{20 \text{ km}}{1 \text{ hour}}$$

$$= 20 \text{ km/h}$$

$$A: m = \frac{10 \text{ km}}{1 \text{ hour}}$$

$$m = 10 \text{ km/h}$$

B is 10 km/h faster.



b) What does the point of intersection represent?

At what time they are an equal distance from the starting point.

28. Selam is on the track team at school. He runs every day after school. One day he ran 6 km in 30 min.

) Calculate the rate of change of Selam's distance from his starting point.

$$m = \frac{6}{30}$$

$$= 0.2$$

b) Explain the meaning of the rate of change.

how many km he can run per minute.

### Section 5: 5.5 First Differences

29. Create a third column for each table of values and calculate the first differences. Classify each relation as linear or non-linear.

a)

x	y
0	2
1	6
2	10
3	14

4  
4  
4  
Linear

b)

x	y
-3	-4
-1	-1
1	1
3	4

3  
2 non-linear  
3

30. These tables show the distance travelled by a canoeist. Without graphing, determine if each relation is linear or non-linear. (Use first differences).

a) In still water:

Time (s)	Distance (m)
0	0
1	1
2	2
3	3
4	4
5	5

1  
1  
1  
1  
1

Linear

b) With the current:

Time (s)	Distance (m)
0	0
1	1
2	3
3	6
4	10
5	15

1  
2  
3  
4  
5

non-linear

Section 6: 5.6 Connecting Variation, Slope, and First Differences

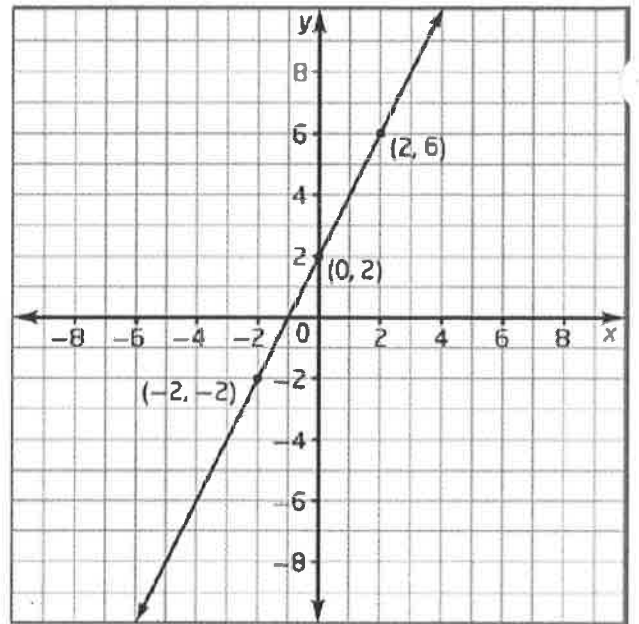
31. Using the following graph:

a) Determine the slope

$$\begin{aligned} m &= \frac{6-2}{2-0} \\ &= \frac{4}{2} \\ &= 2 \end{aligned}$$

b) Determine the y-intercept

$$b = 2$$



c) Write an equation for the relation

$$y = 2x + 2$$

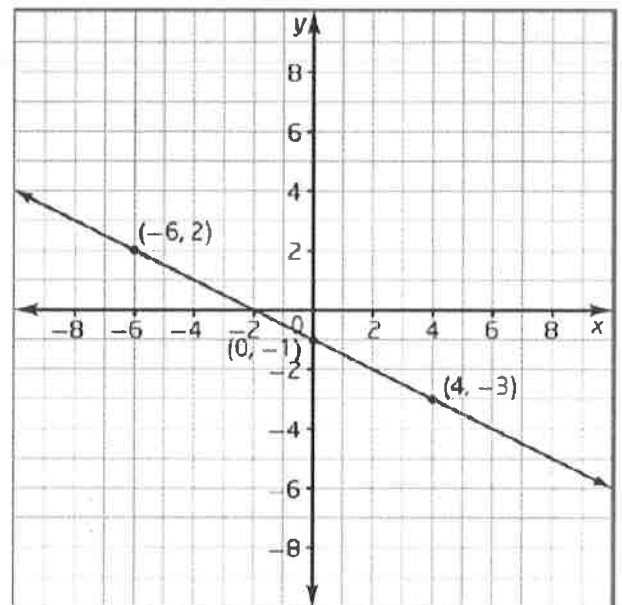
32. Using the following graph

a) Determine the slope

$$\begin{aligned} m &= \frac{2 - (-1)}{-6 - 0} \\ &= \frac{3}{-6} \\ &= -\frac{1}{2} \end{aligned}$$

b) Determine the y-intercept

$$b = -1$$

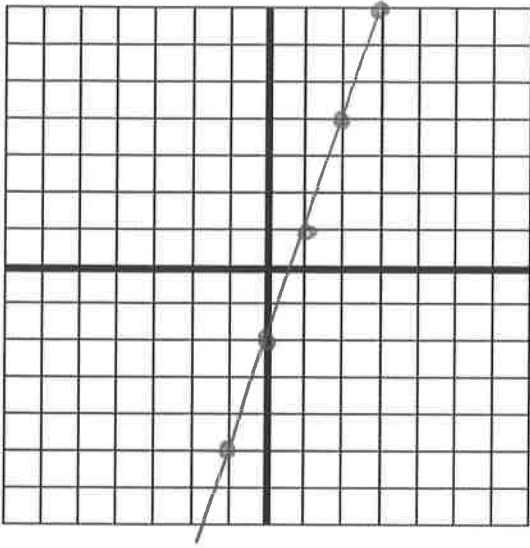


c) Write an equation for the relation

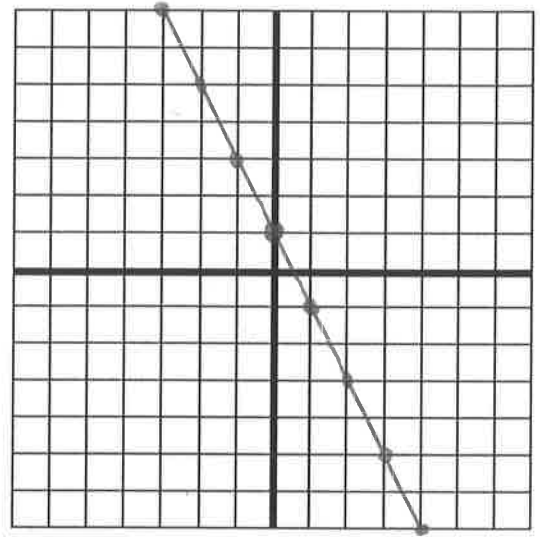
$$y = -\frac{1}{2}x - 1$$

33. Graph each of the following lines on the grids provided.

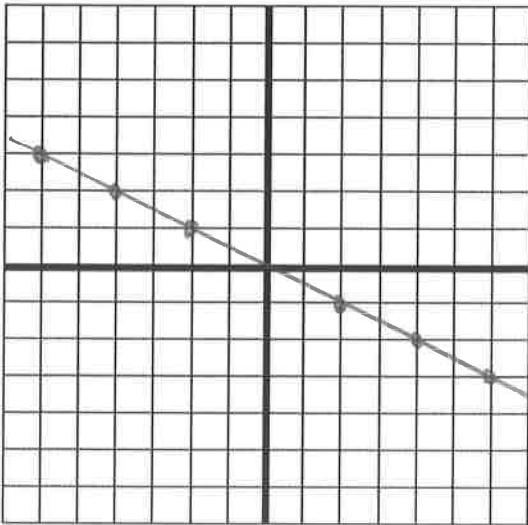
a)  $y = 3x - 2$



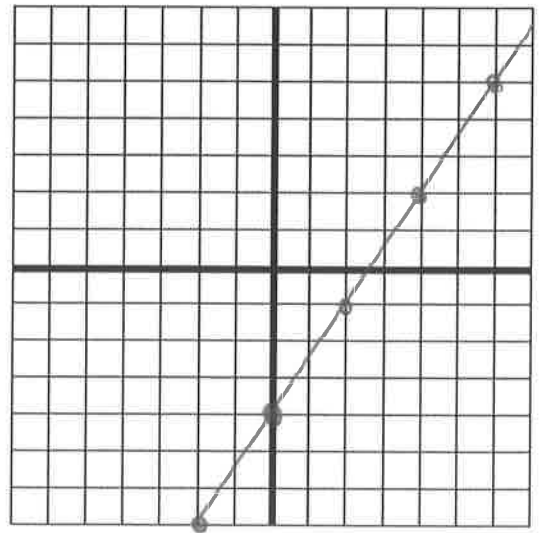
b)  $y = -2x + 1$



c)  $y = -\frac{1}{2}x$



d)  $y = \frac{3}{2}x - 4$



34. Using the following table of values:

x	y
0	1
1	3
2	5
3	7
4	9

a) Calculate the slope of the line

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{3 - 1}{1 - 0} \\ &= \frac{2}{1} \\ &= 2 \end{aligned}$$

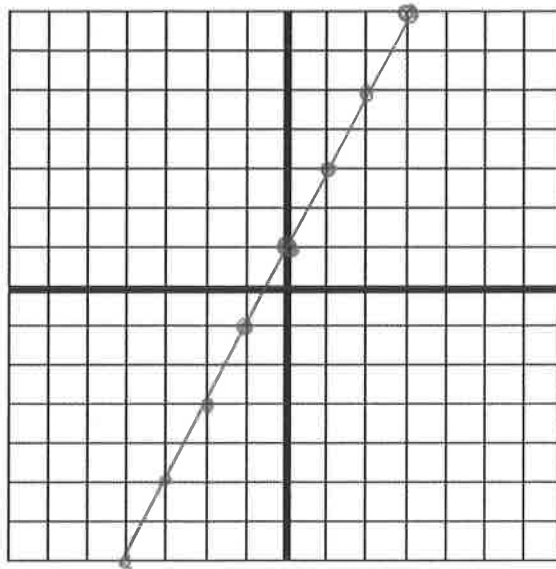
b) What is the y-intercept

$$b = 1$$

c) Write an equation for the relation

$$y = 2x + 1$$

d) Graph the relation



35. Using the following table of values:

a) Calculate the slope of the line

$$\begin{aligned} m &= \frac{1 - 3}{1 - 0} \\ &= \frac{-2}{1} \\ &= -2 \end{aligned}$$

x	y
0	3
1	1
2	-1
3	-3
4	-5



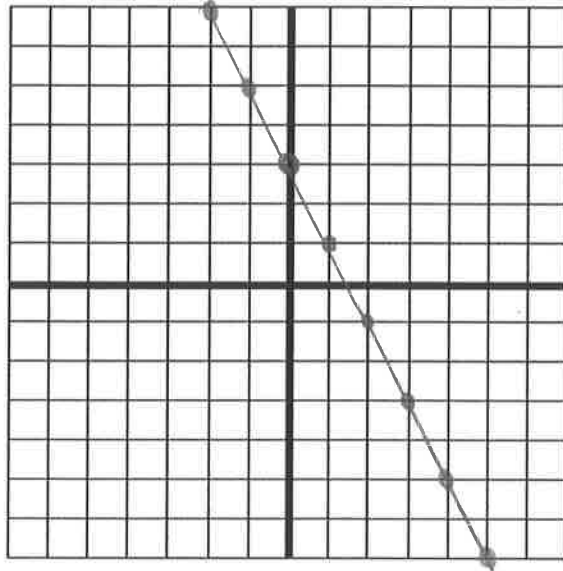
b) What is the y-intercept

$$b=3$$

c) Write an equation for the relation

$$y = -2x + 3$$

d) Graph the relation



36. The cost of renting a bicycle is \$20.00 plus \$2.00 per hour.

a) Write an equation for this relation

$$y = 2x + 20$$

b) Is this direct or partial variation?

partial

37. ~~37~~.  $y$  varies directly with  $x$ . When  $x=5, y=11$

$(5, 11)$  and  $(0, 0)$

a) What is the slope of the line

$$m = \frac{11-0}{5-0}$$

$$= \frac{11}{5}$$

b) What is the  $y$ -intercept (hint: what is the  $y$ -intercept of all direct variation relationships?)

$$b = 0$$

c) Write an equation for the line

$$y = \frac{11}{5}x$$

38. ~~38~~.  $y$  varies partially with  $x$ . When  $x = 0, y=4$ , and when  $x = 2, y=7$ .

a) What is the slope of the line?

$$m = \frac{7-4}{2-0}$$

$$= \frac{3}{2}$$

$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$
--

b) What is the  $y$ -intercept (what is the  $y$ -value when  $x=0$ ?)

$$b = 4$$

c) Write an equation for the line

$$y = \frac{3}{2}x + 4$$