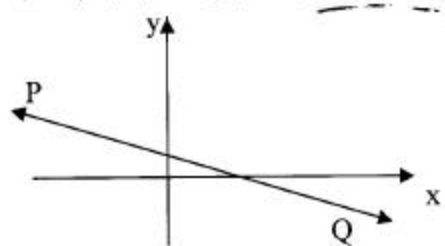


3.3 The Slope of a Line

In class work: Solve each problem.

1. Compute the slope of the line that passes through the points:

a) $P(-4, 2)$ and $Q(5, -1)$

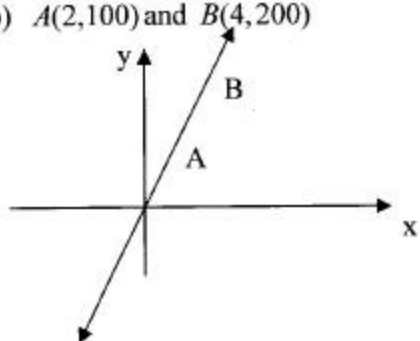


$$m = \frac{\Delta y}{\Delta x} = \frac{2 - (-1)}{-4 - 5}$$

$$m = \frac{2+1}{-9}$$

$$m = \frac{3}{-9}, \quad \boxed{m = -\frac{1}{3}}$$

b) $A(2, 100)$ and $B(4, 200)$

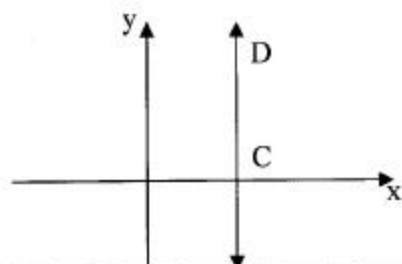


$$m = \frac{\Delta y}{\Delta x} = \frac{200 - 100}{4 - 2}$$

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

$$\boxed{m = 50}$$

c) $C(4, 0)$ and $D(4, 10)$

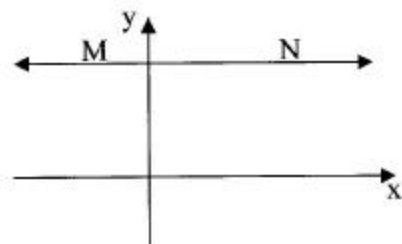


$$m = \frac{\Delta y}{\Delta x} = \frac{10 - 0}{4 - 4}$$

$$m = \frac{10}{0}$$

$$\boxed{m = \text{undefined}}$$

d) $M(-2, 3)$ and $N(5, 3)$



$$m = \frac{\Delta y}{\Delta x} = \frac{3 - 3}{5 - (-2)}$$

$$m = \frac{0}{7}$$

$$\boxed{m = 0}$$

Property #1

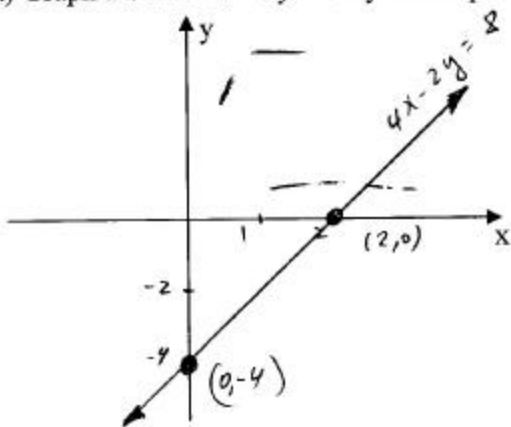
A line is descending if and only if its slope is negative.

A line is ascending if and only if its slope is positive.

A line is vertical if and only if its slope is undefined.

A line is horizontal if and only if its slope is zero.

2. a) Graph the line $4x - 2y = 8$ by intercepts.



x	y
0	-4
2	0

$(0, -4) = y\text{-int}$
 $(2, 0) = x\text{-int}$

when $x=0$, $-2y=8$, $y=-4$
 when $y=0$, $4x=8$, $x=2$

b) Compute the slope using the x-intercepts and y-intercepts.

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

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

$$m = 2$$

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

c) Compute the slope using $(4, 4)$, $(1, -2)$.

Note that $(4, 4)$ and $(1, -2)$ are both on the line (or they both satisfy the equation)
 $4(4) - 2(4) = 8$
 $4(1) - 2(-2) = 8$

$$m = \frac{\Delta y}{\Delta x} = \frac{4 - (-2)}{4 - 1} = \frac{6}{3} = 2$$

$$m = 2$$

Property #2

A line has constant slope.

The Meaning of Slope

3. The distance in miles that a car is driven is given by $d = 55t$, where t is the number of hours the car is driven.

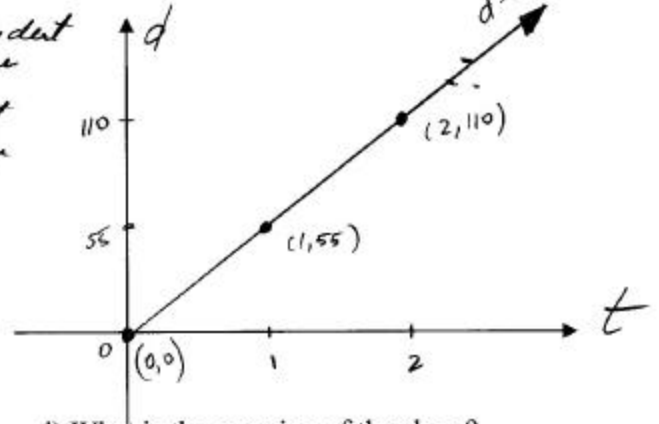
a) Make a table of values.

$d = 55t$

$t = \text{time (hr)} - \text{independent variable}$
 $d = \text{distance (mi)} - \text{dependent variable}$

t	d
0	0
1	55
2	110

b) Graph the equation



c) Using 2 points, compute the slope.

In general, $m = \frac{\Delta y}{\Delta x}$
 In our case, $m = \frac{\Delta d}{\Delta t} = \frac{55-0}{1-0} = 55 \frac{\text{mi}}{\text{h}}$

d) What is the meaning of the slope?

$m = 55 \frac{\text{mi}}{\text{h}}$ is the rate of change of distance with respect to time (rate of the car)

4. a) For each graph, choose 2 points and compute the slope (including units).

b) Explain what the slope measures in the context of the problem.

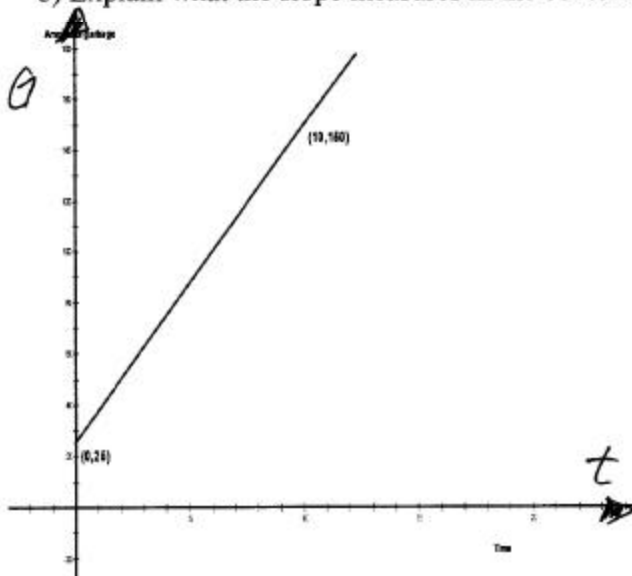


Fig. shows the amount of garbage, G , (in tons) that has been deposited at a dump t years after new regulations go into effect.

$(0, 25)$ and $(10, 150)$
 $m = \frac{\Delta G}{\Delta t} = \frac{150-25}{10-0} = \frac{125}{10}$

$m = 12.5$ tons per year
 The rate at which the garbage is deposited is 12.5 tons per year.

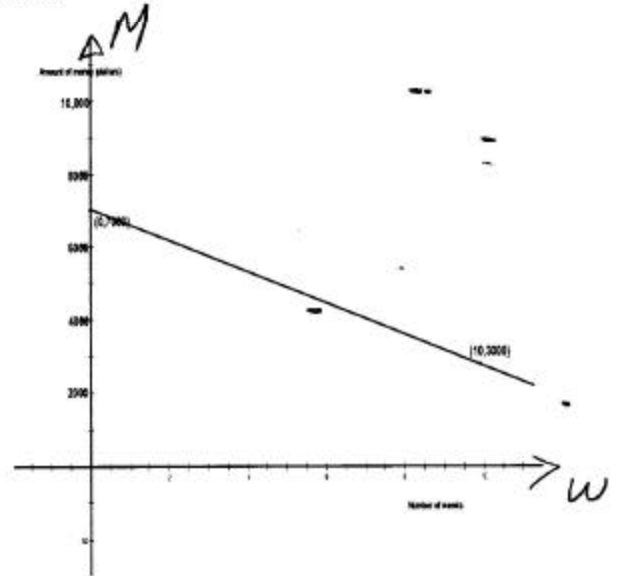


Fig. shows the amount of money, M (in \$) in Tammy's bank account w weeks after she loses all sources of income.

$(0, 7000)$ and $(10, 3000)$
 $m = \frac{\Delta M}{\Delta w} = \frac{3000-7000}{10-0} = \frac{-4000}{10}$

$m = -400$ \$/week
 The rate at which the money decreases in the account is 400 \$ per week.