17

P Test 7a 9. 10

17) $f(x) = \begin{cases} 30 & \text{if } 0 \le x \le 200 \\ 30 + 0.03(x-200) & \text{if } x > 200 \end{cases}$

$= \begin{cases} 30 & \text{if } 0 \le x \le 200 \\ 30 + 0.03x - 6 & \text{if } x > 200 \end{cases}$

$= \begin{cases} 30 & \text{if } 0 \le x \le 200 \\ 24 + 0.03x & \text{if } x > 200 \end{cases}$

b) $f(x) = \begin{cases} 0.05x & \text{if } 0 \le x \le 50\,000 \\ 0.05(50\,000) + 0.12(x - 50000) & \text{if } x > 50\,000 \end{cases}$

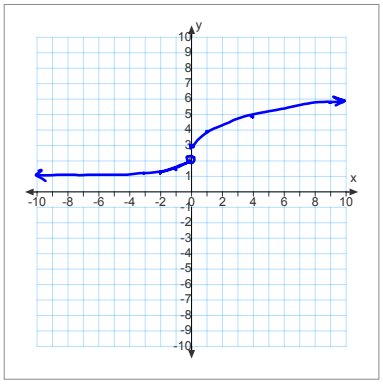
$= \begin{cases} 0.05x & \text{if } 0 \le x \le 50000 \\ 2500 + 0.12x - 6000 & \text{if } x > 50000 \end{cases}$

$= \begin{cases} 0.05x & \text{if } 0 \le x \le 50\,000 \\ 0.12x - 3500 & \text{if } x > 50000 \end{cases}$

9a) $125\,000 = 50\,000 + 75\,000$

$\text{Tax} = 50\,000(0.05) + 75\,000(0.12)$

a) $f(x) = \begin{cases} 2^x + 1 & \text{if } x < 0 \\ \sqrt{x} + 3 & \text{if } x \ge 0 \end{cases}$



b) Not continuous (discontinuous)

c) int of increase $x \in \mathbb{R}$ $(-\infty, \infty)$

int of decrease NONE

d) $D: (-\infty, \infty)$

$R: (1, 2) \cup [3, \infty)$

End behaviour:
as $x \to -\infty$, $y \to 1$
as $x \to \infty$, $y \to \infty$

$D: \{x \in \mathbb{R}\}$

$R: \{y \in \mathbb{R} \mid 1 < y < 2 \text{ and } y \ge 3\}$

7a) $(3, 5)$ $y = f(x)$

$y = 3f(-x+1) + 2$

$= 3f(-1(x-1)) + 2$

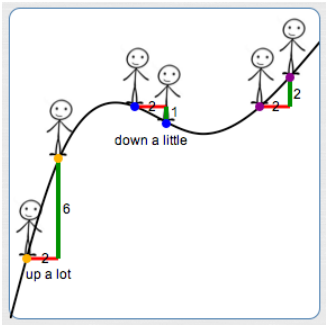
$(x, y) \to (-x+1, 3y+2)$

$(3, 5) \to (-3+1, 3(5)+2)$

Lesson 2.01: Average Rate of Change

Learning Goals:

- I can calculate and interpret the average rate of change



Consider two scenarios:

1. Kate travels 240km in 3 hours at a consistent speed.
2. James travelled
   > 120km in one hour of driving.
   > Then hit trafic and only travelled 60km in 90 minutes.
   > Then travelled 120km/h for another half hour.

Then travelled 120 km/h for another half hour

Distance	Time	Rate
d=rt	t=d/r	r=d/t
240 km	3 h	80 km/h
120 km	1 h	120 km/h
60 km	1.5 h	40 km/h
60 km	0.5 h	120 km/h

The ***average rate of change***, in any relation, is the change in quantity of the dependent variable divided by the corresponding change in amount of the independent variable.

The average rate of change of $y=f(x)$

The average rate of change of $y = f(x)$ with respect to x on the interval $x_1 \le x \le x_2$ is

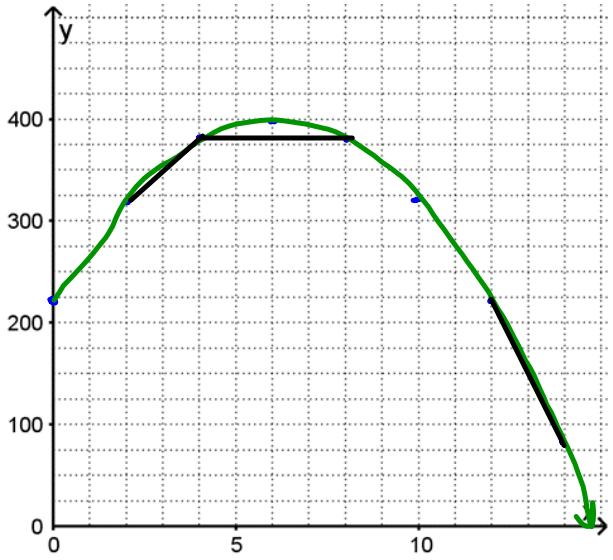
$$\frac{\Delta y}{\Delta x} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

Slope!

Ex. 1 A rocket is shot off of a cliff. The height of the rocket, in metres, is given by the equation $h(t) = -5t^2 + 60t + 220$, where t is in seconds.

t	0	2	4	6	8	10	12	14
h	220	320	380	400	380	320	220	80

a) Plot the points to graph the function.



b) Find the average rate of change over each interval. $h(t) = -5t^2 + 60t + 220$

i) $2 \le t \le 4$

$\frac{\Delta y}{\Delta x} = \frac{f(4) - f(2)}{4 - 2}$

$= \frac{380 - 320}{4 - 2} = 30$ m/s

ii) $12 \le t \le 14$

$\frac{\Delta y}{\Delta x} = \frac{80 - 220}{14 - 12}$

$= -70$ m/s

iii) $4 \le t \le 8$

$\frac{\Delta y}{\Delta x} = \frac{380 - 380}{8 - 4}$

$= 0$ m/s

Graphically, the average rate of change is the slope of the ***secant line*** passing through the points $(x_1, f(x_1))$ and $(x_2, f(x_2))$.

Read and understand pg. 75 "Need to Know".

Complete: pg. 76-78 #2, 6, 7, 10, 12, 13