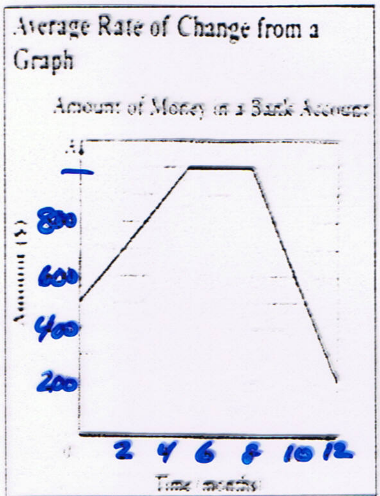
1.5 Slopes of Secants and Average Rate of Change

A **rate of change** is a measure of the change in one quantity (the dependant variable) with respect to a change in another quantity (the independent variable)

An **average rate of change** is a change that takes place over an interval.

Example #1: The graph represents the amount of money in a bank after one year.
Calculate the average rate of change for each time period and interpret these values for this situation.



month 0 to month 5

Average Rate of Change $= \frac{\Delta A}{\Delta t}$

$= \frac{1000 - 500}{5 - 0}$

$= \frac{500}{5}$

$= \$100/\text{month}$

The money in the account is increasing on average by $100 per month.

month 5 to month 8

Av RofC $= \frac{\Delta A}{\Delta t}$

$= \frac{1000 - 1000}{8 - 5}$

$= 0$

The money in the account stays the same.

month 8 to 12

Av RofC $= \frac{\Delta A}{\Delta t}$

$= \frac{200 - 1000}{12 - 8}$

$= \frac{-800}{4}$

$= \$-200/\text{month}$

The money in the account is decreasing on average, $200 per month

Example #2: If a ball is dropped from the top of a 120m cliff, its height, *h*, in metres, after *t* seconds can be modelled by $h(t) = 120 - 4.9t^2$.

a) Find the average rate of change of the height of the ball with respect to time over the intervals:

i) 1 s to 4 s

Ave RofC $= \frac{\Delta h}{\Delta t}$

$= \frac{h(4) - h(1)}{4 - 1}$

$= \frac{41.6 - 115.1}{3}$

$= -24.5\text{ m/s}$

ii) 4 s to 6 s

-49 m/s

iii) 6 s to 7 s

-63.7 m/s

b) What does the average rate of change represent in this situation?

the average speed of the ball over the given interval.

c) Interpret the significance of your answer in part a)

Between 1 and 4s, the ball is dropping at an average speed of 24.5m/s

Homework: pg 62; # 1, 5, 6(use TI), 7, 8, 10, 12