

6.1 Average Rates of Change Lesson

This document was composed and formatted by Annie Bernatchez.

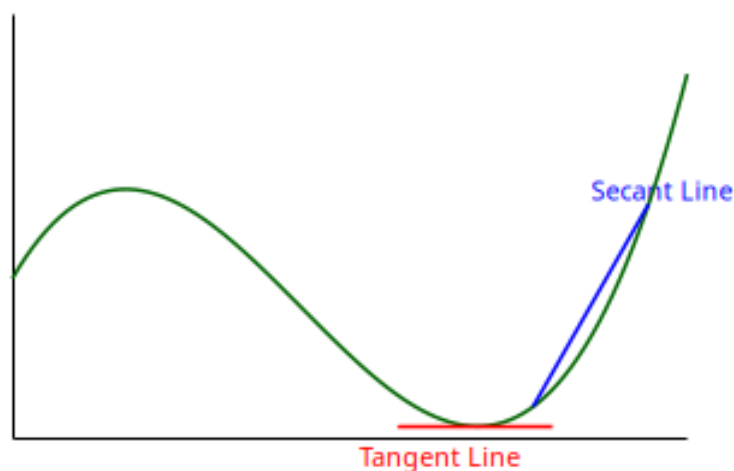
The course material originated from www.jensenmath.ca

Part 1: Terminology

_____ : a measure of the change in one quantity (the dependent variable) with respect to a change in another quantity (the independent variable).

_____ : a line that passes through two points on the graph of a relation

_____ : a line that touches the graph of a relation at only one point within a small interval



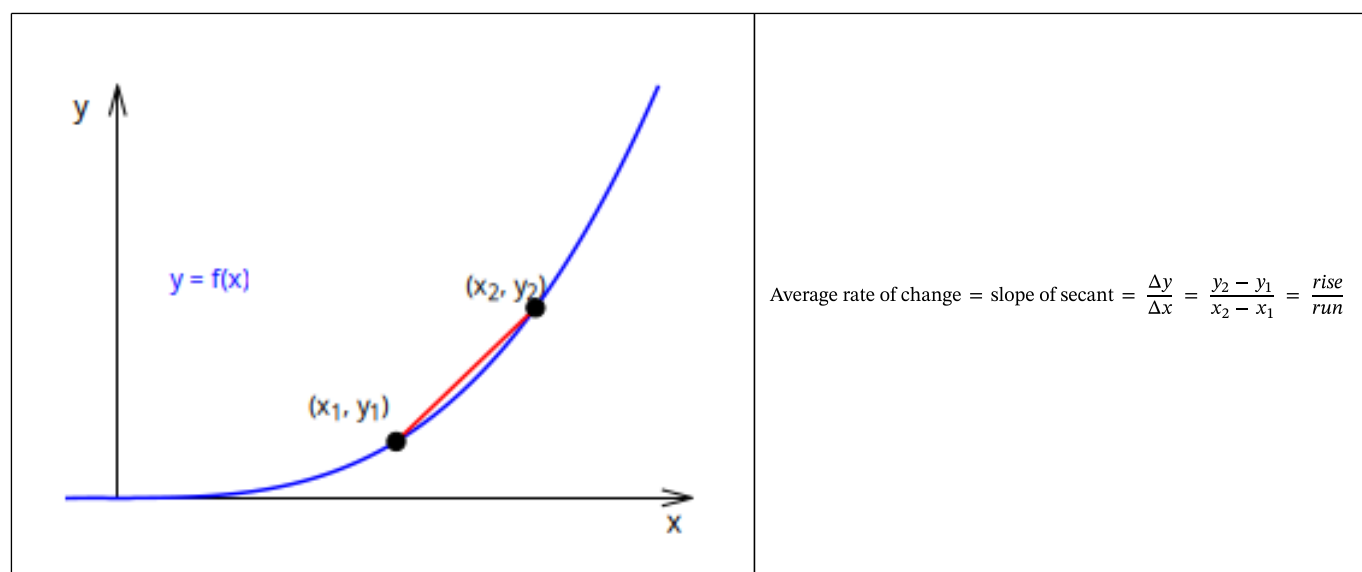
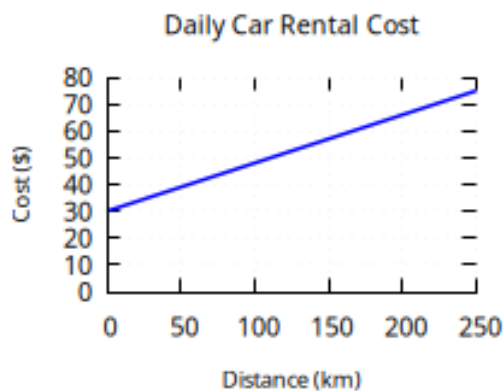
An _____ is a change that takes place over an _____, while an _____ is a change that takes place in an _____. We will focus on average rates of change in this section.

An average rate of change corresponds to the slope of a _____ between two points on a curve.

Part 2: Average Rates of Change from a Table or Graph

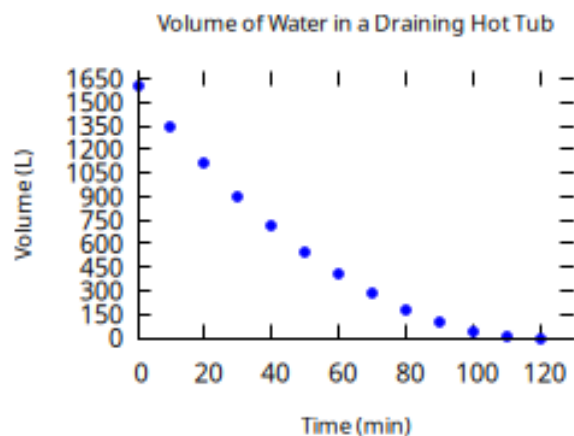
Note: All _____ relationships have a constant rate of change. Average rate of change calculations over different intervals of the independent variable give the _____ result.

We will be focusing on _____ relationships. Non-linear relationships do not have a constant rate of change. Average rate of change calculations over different intervals of the independent interval give _____ results.



Example 1: Andrew drains water from a hot tub. The tub holds 1600 L of water. It takes 2 hours for the water to drain completely. The volume v , in Liters, of water remaining in the tub at various times t , in minutes, is shown in the table and graph.

Time (min)	Volume (L)
0	1600
10	1344
20	1111
30	900
40	711
50	544
60	400
70	278
80	178
90	100
100	44
110	10
120	0



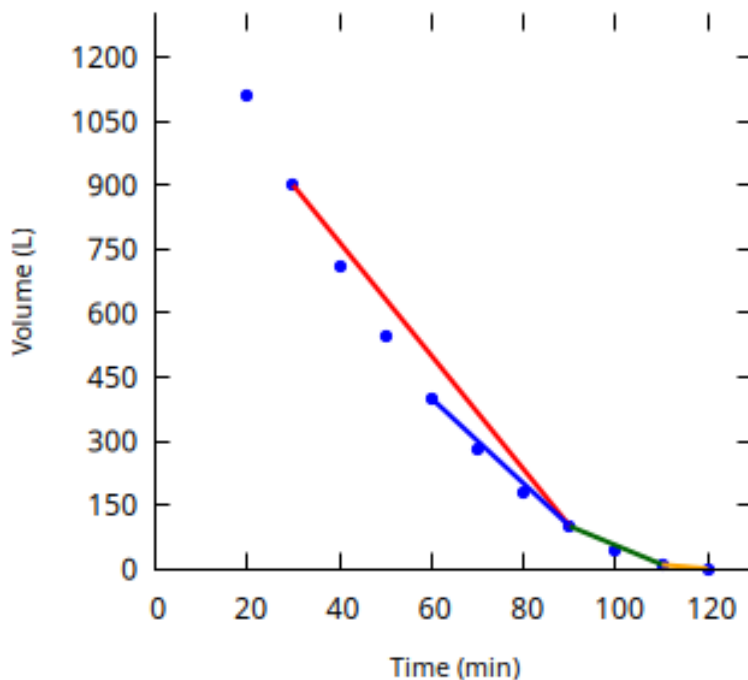
a) Calculate the average rate of change in volume during each of the following time intervals.

i) $30 \leq t \leq 90$

ii) $60 \leq t \leq 90$

iii) $90 \leq t \leq 110$

iv) $110 \leq t \leq 120$



b) Does the tub drain at a constant rate?

A _____ rate of change indicates the quantity of the dependent variable is decreasing over the interval. The secant line has a negative slope.

A _____ rate of change indicates the quantity of the dependent variable is increasing over the interval. The secant line has a positive slope.

Part 2: Average Rate of Change from an Equation

Example 2: A rock is tossed upward from a cliff that is 120 meters above the water. The height of the rock above the water is modelled by $h(t) = -5t^2 + 10t + 120$, where h is the height in meters and t is the time in seconds. Calculate the average rate of change in height during each time interval.

a) $0 \leq t \leq 1$

b) $1 \leq t \leq 2$

c) $2 \leq t \leq 3$

