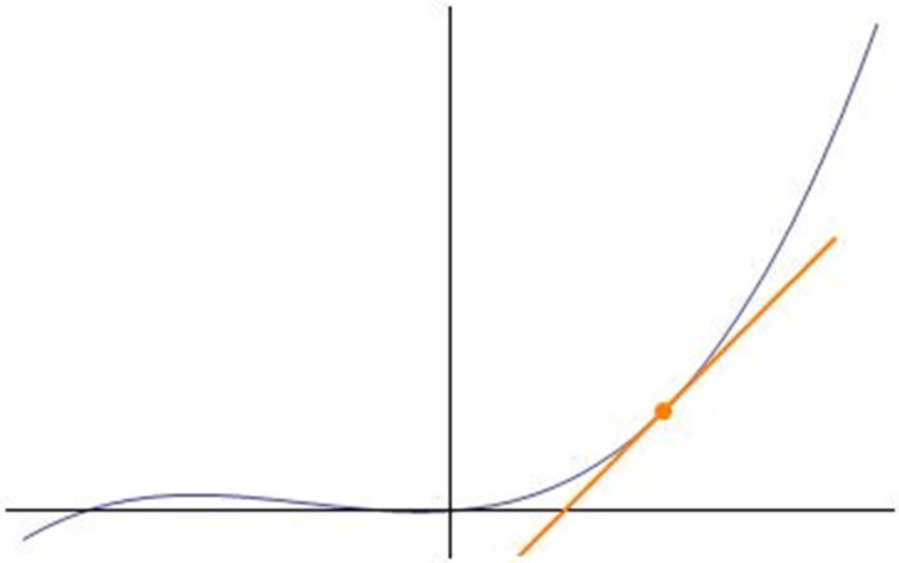
CALCULUS

Chapter 3 –Applications of the Derivative

(*Material adapted from Chapter 3 of your text*)



Math@TD

Chapter 3 – Applications of the Derivative

Contents with suggested problems from the Nelson Textbook (Chapter 3)

3.1 Higher Order Derivatives: Velocity and Acceleration

Higher Order Derivatives

Recall that given some function $f(x)$ we can find the derivative $f'(x)$ which is itself a function. Thus, we should be able to find the "**derivative of the derivative**". This is the essence of **higher order derivatives**.

Example 3.1.1

Consider the function:

$$f(x) = 3x^4 - 2x^2 + 1$$

Question

Given a polynomial function of degree *n*, what is the maximum number of derivatives that can be calculated?

Position, Velocity and Acceleration

We will consider the motion of a particle in a straight line for our considerations of velocity and acceleration. One thing will be necessary. **We must define a positive direction of motion**, and interpret our results in light of that definition.

Example 3.1.2

Given that an object is moving in a straight line, and that the object's position is defined/modelled by

$$s(t) = t^3 - 6t^2, \quad t \geq 0$$

Determine:

a) $v(t)$

b) $a(t)$

c) in what direction the object is moving at $t = 1\text{sec}$, $t = 3$ sec, $t = 5$ seconds.

Assume that moving to the right is motion in the positive direction.

d) the object's acceleration at the same times as in part c).

e) when the object is at rest.

f) when the acceleration is zero

g) draw a **position diagram** describing the motion of the object.

Class/Homework for Section 3.1

Pg. 127 - 129 #2 – 5, 8, 10, 12 – 16, Read Ex's 2 and 4