CALCULUS

Chapter 2 –The Derivative

(*Material adapted from Chapter 2 of your text*)

A∞Ω
MATH@TD

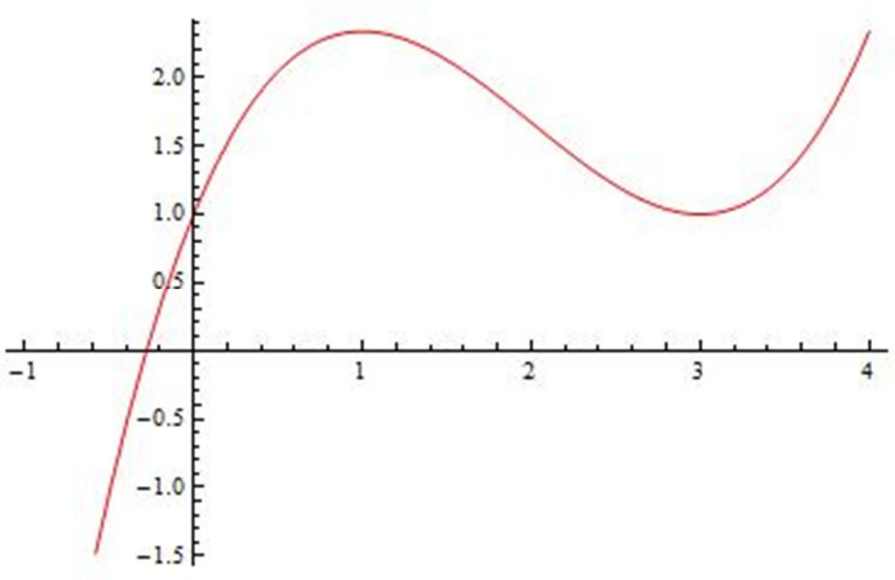
Chapter 2 – The Derivative

Contents with suggested problems from the Nelson Textbook (Chapter 2)

2.1 The Derivative as a Function

Recall the concepts of **AROC (AVERAGE RATE OF CHANGE)** and **IROC (INSTANTANEOUS RATE OF CHANGE)**

Consider the Picture



Clearly the AROC and the IROC are measuring **change** in a function. In a sense, **Calculus is the study of change using functions**. Because **the IROC is fundamental** to studying change through functions, it was given a name: **The Derivative**.

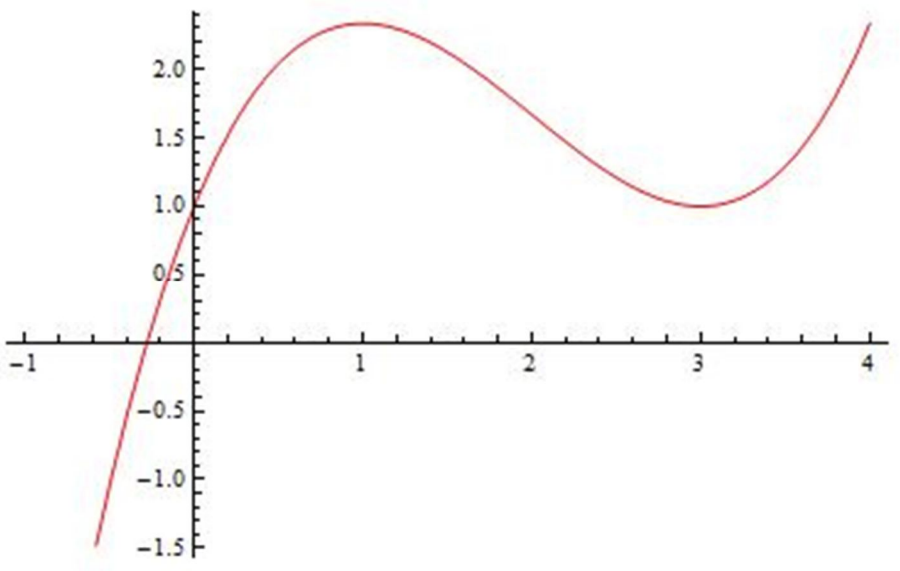
The Derivative of a Function at a Point

Definition 2.1.1

Given a function $f(x)$, and a point on the function $P(a, f(a))$, then the **derivative** of $f(x)$ at $x = a$ is

Note:

Consider, again, the picture:



Example 2.1.1

Determine the derivative of $f(x)=\dfrac{1}{x+2}$ at $x=-1$.

Calculating the derivative at a single point is useful, but if the calculation needs to be done at multiple points, tedium may set in. It is much more useful to have the derivative as a "number generator. That is, it will be useful to consider the derivative as a FUNCTION.

The Derivative as a Function

Definition 2.1.2

The derivative of a function, $f(x)$, is given by

Example 2.1.2

Determine the derivative of $g(x)=\sqrt{x+1}$ at and point $\left(x, g(x)\right)$. Use the derivative function to determine the **numbers** $g'(3)$, and $\frac{dg}{dx}(0)$.

Example 2.1.3

Determine $\frac{df}{dx}(x)$ for $f(x)=x^3$.

Differentiability

Definition 2.1.3

A function $f(x)$ is said to be **differentiable** at $x=a$ if

There are three types of non-differentiability.

Class/Homework for Section 2.1

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