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MATH@TD

MCV4U – Winter 2013
Chapter 2 – The Derivative - ***Review***

In Chapter 2 we explored the fundamental concepts surrounding The Derivative. We saw the formal definition of the derivative, and used that definition to develop various simplifying differentiation rules.

Section 2.1 – The Derivative as a Function

A derivative can be described as:

1. An instanteous rate of change (or at least - the method for calculating IROC)
2. A slope finding fn for tangents

The Formal (First Principles) Definition of the Derivative

$$f'(x) = \lim_{h \to 0} \left(\frac{f(x+h) - f(x)}{h} \right)$$

You must have this definition memorized, and you must know how to use it to find a derivative "From First Principles""

Section 2.2 – The Derivatives of Polynomial Functions

In this section we saw/proved some basic simplifying rules for finding derivatives.

The Constant Function Rule $\quad f(x) = k \Rightarrow f'(x) = 0$

The Power Rule $\quad f(x) = c \cdot x^n \Rightarrow f'(x) = n \cdot c \cdot x^{n-1}$

Sums and Differences of Power Functions $\quad g(x) = cx^a \pm bx^d$

$$g'(x) = a \cdot c x^{a-1} \pm d \cdot b x^{d-1}$$

Section 2.3 – The Product Rule

In this section proved, from first principles, the Product Rule:

Given two differentiable functions $f(x)$and $g(x)$ then the product function

$$F(x) = f(x) \cdot g(x)$$

is also differentiable, and

$$F'(x) = f'(x) \cdot g(x) + f(x) \cdot g'(x)$$

Know the rule forwards and backwards! – and even sideways.

Section 2.4 – The Quotient Rule

Here we saw another rule, but we did not prove it. You get to prove the rule, from first principles, yourselves. No need to thank me.

The Rule:

Given two differentiable functions $f(x)$and $g(x)$ then the quotient function

$$F(x) = \frac{f(x)}{g(x)}$$

is also differentiable, and

$$F'(x) = \frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{(g(x))^2}$$

Section 2.5 – The Chain Rule (The Derivatives of Composite Functions)

In this final section of the chapter we saw how to differentiate a composite function.

Given two differentiable functions $f(x)$and $g(x)$ then the composite function

$$F(x) = (f \circ g)(x) = f(g(x))$$

is also differentiable, and

$$F'(x) = f'(g(x)) \cdot g'(x)$$ leave inner alone

In Leibniz Notation:

$$\frac{dF(x)}{dx} = \frac{df(g(x))}{dx} \cdot \frac{dg(x)}{dx}$$

Make sure you understand the notions "outer function" and "inner function" as they relate to composite functions.

Review Problems:
Pg 110 – 113 #2bc, 3-5, 7, 8, 10a, 11 – 13, 17, 21 – 23, 28, 30