Math 165: Calculus for Business

http://www.math.uic.edu/coursepages/math165/index_html

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[Look at website for practical information...]

What are we going to do in this course?

• Derivatives. The derivative of a function measures the *instantaneous rate of change*. One of the primary uses we'll see is in finding maximums (like maximum profits, or speed, or customers) or minimums (like minimum cost to produce given some constraints, ...).

• Integrals. The integral measures the *area under a curve*. This is useful for adding up a collection of things.

Functions

A function is a mapping from a domain to a range.

It assigns to each element of the domain an element of the range.

If the function is f, the domain X and the range Y, we write $f : X \to Y$. Sometimes we write $X \xrightarrow{f} Y$.

If x is in the domain, we write $f(x)$ for the element of Y assigned to x.

(Examples)

Some fundamental functions in economics:

• The **demand function** measures how many widgets will be sold given a certain price.

• The **supply function** measures how many widgets the producers will make given a particular price.

• The **revenue function** gives the revenue $R(x)$ from selling x units. If the price of each widget is p then the revenue is

$$R(x) = x.p$$

NOTE: It may be that the price is determined by the quantity x as well, so we'd have $R(x) = x.p(x)$.

• The **cost function** is the cost given as a function of units produced. We write $C(x)$ for the cost of producing x units.

• The **profit function** is the revenue minus the cost:

$$P(x) = R(x) - C(x) = x.p(x) - C(x).$$

Composing functions

Suppose we have two function f and g, where the range of f is the same as the domain of g. Then we can take the output of f and 'plug' it into g to get a new function.

We write $g(f(x))$, for x in the domain of f. The new function is written $g \circ f$.

IMPORTANT: $g \circ f$ means 'do f first, then do g.

Suppose we have $f : X \to Y$ and $g : Y \to Z$. Then we get $g \circ f : X \to Z$, which we can see as

$$X \xrightarrow{f} Y \xrightarrow{g} Z.$$

Graphing functions.

Suppose we have a function $f : X \to Y$ where X and Y are both collections of numbers.

Then we form the graph in the plane. This is the set of points $(x, f(x))$ in the plane, where x is in X and $f(x)$ is in Y.

Examples with grapher...

x-**intercepts** and y-**intercepts**