Parameters

Thursday, September 27, 2012

The idea of a *parameter* in a function can be tricky to get used to. In a function of one variable, like **f(x)**, a *parameter* would be an unknown quantity, used in the definition of **f**, that does not depend on the variable, **x** (in other words, a constant unknown quantity, which we might call a *constant*).

So if **f(x) = mx+2**, and we say "**m** is constant", then **m** is a parameter and it does not depend on **x**. The derivative will be **f'(x) = m**.

Compare this with **f(x) = a h(x) + 2**, where **a** is a parameter and **h** is a function of **x**. Then the derivative will be **f'(x) = a h'(x)** and the product rule is not needed, since **a** is constant with respect to **x**.

Example:
Over a year, the fixed costs for a calculator business are **b** dollars, and variable costs are **a** dollars per unit. The values of **a** and **b** might change from year to year, but they are constant during any one fiscal year. We do not know the demand equation at the moment, but the price, **p**, and quantity sold, **q**, are related.

1. The cost function with respect to quantity, **q**, is:

2. The revenue function with respect to quantity, **q**, is:

3. The profit function with respect to quantity, **q**, using the above information, is:

4. The derivative of the profit function, **P**, with respect to quantity, **q**, (which we will call the *marginal profit)* is:

5. What happened to **b**? Does it make sense that the marginal profit does not depend on **b**?

Piecewise function involving parameters, example

Suppose that f(x) is defined by

$$f(x) = \begin{cases} \frac{x^2-4}{x-2} & \text{if } x < 2 \\ ax^2 - bx + 3 & \text{if } x \geq 2 \end{cases}$$

6. For which values of **a** and **b** (if any) is the function continuous for all values of **x**?

$\lim_{x \to 2^-} f(x) = \lim_{x \to 2^-} \frac{x^2-4}{x-2} =$

7. For which values of **a** and **b** (if any) is the function differentiable for all values of **x**?

8. What changes in your work for #6 and #7 above if instead we use the function: (You will probably need more space to finish this one, but give it a try if you are happy with your work on the other parts.)

$$f(x) = \begin{cases} \frac{x^2-4}{x-2} & \text{if } x < 2 \\ ax^2 - bx + 3 & \text{if } 2 < x < 3 \\ 2x - a + b & \text{if } x \geq 3 \end{cases}$$