11/9/06

The Great Derivative Hunt !

Calculus can be characterized as the study of the concept of a function and its use in describing certain phenomena in the real world. The differential equations we have studied enable us to find the right function for a certain situation by using a condition that relates the rate of change of the unknown function to its value. For the remaining chapters of our text, we will need to keep in mind the meaning of derivative and to this end, I am offering 5 extra credit points for the following activity:

Find a function (that nobody else in the class has found) and interpret its derivative as the rate at which the function changes per unit change in the independent variable (in the limit of very small changes).

Examples:

distance traveled = f(time),   velocity = lim (Δ distance/Δ time)
The velocity may be interpreted as the distance that will be traveled in the next hour (say).

mass of wire = f(length of wire),   density of wire = lim (Δ mass/Δ length)
The density at a point in the wire may be interpreted as the extra mass of the next millimeter (say) at that point.

blood pressure = f(blood adrenalin level)
derivative= lim(Δ blood pressure / Δ adrenalin level)
The derivative may be interpreted as the increase in blood pressure from the next unit of adrenalin administered.

shoe sole thickness = f(distance walked)
derivative = lim(Δ thickness/Δ distance walked)
The derivative may be interpreted as the rate of wear, i.e., how much the thickness will change in the next mile walked

Your function, written out as shown in the examples above, must be read to the class, and turned in on a piece of paper with your name on it. I will accept a few each class for the next few weeks.