Mathematics 131, section 1 – Calculus for Physical and Life Sciences
Discussion 2 – Derivative Rules
October 18, 2004

Background

We have now seen

- the *product rule*: $\frac{d}{dx}(f(x)g(x)) = f'(x)g(x) + f(x)g'(x)$,
- the *quotient rule*: $\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2}$,
- and the *chain rule*: $\frac{d}{dx}(f(g(x)) = f'(g(x))g'(x)$ for derivatives.

Today, we want to practice using these rules to compute some additional derivative examples, and do some problems using them.

Discussion Questions

1) Compute the derivative of each function with respect to the stated independent variable. State which rule(s) you are using, and simplify as much as possible.

a) $p(x) = \frac{1}{\sqrt{x^2 - 6x + 9}}$

b) $W(s) = (2^s + 1)^4$

c) $g(t) = t^2 e^{-t^2}$

d) $f(u) = \frac{3^u - 1}{3^{2u} + 1}$

e) $F(z) = \sqrt[3]{e^{4z} - 1}$

2) The balance B (in dollars) in a bank account earning 1% interest ("compounded continuously") at time t years after the initial deposit of \$1000 is $B(t) = 1000e^{0.01t}$. What is the balance at $t = 5$ years? At what rate is the balance changing at that time? What are the units of your second answer? Interpret this in financial terms.

3) Find a formula for the derivative of a product of three functions:

$$\frac{d}{dx}(f(x)g(x)h(x)) = ?$$

Hint: You can group the terms as $f(x)(g(x)h(x))$ and treat the part in the parentheses as a single function. Use your formula to find the derivative of $H(t) = \sqrt{t}(t^2 + 1)^4 e^t$.

Assignment

Solutions due at the end of the class period today (one per group).