OPPORTUNITY 1 FALL '06

Yippee! Your first opportunity to show off what you've learned so far!

No calculators or cell phones are allowed. If you have any questions, please ask Lucia or Dave. Explaining your reasoning will help you earn partial credit if your answer isn't entirely correct. Please write clearly and legibly; scratch paper will be available.

1. We'll start with some deriviatives. In each of the following, find y' (a.k.a. $\frac{dy}{dx}$).

a) $y = e^{\sin x}$

b) $y = \sinh(2x)$

c) $y = \ln(x^2 + x)$

d) $y = \int_1^x \frac{1}{\sqrt{t^2+t}}\, dt$

e) $\int_x^{2x} \frac{1}{t}\, dt$

f) By the time I turn 30 I want to have . . .

2. Integrate the following:

a) $\displaystyle\int \frac{u}{u-1}\, du$

b) $\displaystyle\int \frac{e^{2x} - e^{-2x}}{2}\, dx$

c) $\displaystyle\int dx$

d) $\displaystyle\int \pi x^4 + e x^5\, dx$

3. Calcuate the area of the region bounded by the following functons , $y = 0$, and . (Please don't simplify your answer.)

4. Let $f(x) = e^{x^3} + 1$.

Find the inverse function, $g(x) = f^{-1}(x)$.

Find $f(0)$

Find $g'(1)$ (Hint: there are two ways to do this.)

5. Let A be the bounded region between the graphs of f and g as shown.

a) Write an integral that calculates the area of A.

b) Write an integral that gives the volume of the solid generated by spinning this region around the x-axis.

c) Explain why the integral in part b works. Be sure to explain each part of the formula.

Extra Credit: There's a move in Washington to change the health care system in the US. Right now there are five bills in Congress that are being considered. For half a point each, name up to six major changes that are contained in these bills.