Calculus II, Spring '05 Name:_____

Opportunity I

Yippee! It's your first chance to show me what you've learned so far this semester. No calculators or cell phones are allowed. If you have any questions, please ask me or Karina. 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. Say the name Euler. Out loud. Now.

2. The graph here shows a piece of the function $f(x)$. Note that the slope of f at $x = 5$ is $1/3$. Draw in (on the same axes) everything you know about the function $g(x) = f^{-1}(x)$. Give an equation for the tangent line to g at some point.

If $f(x) = (\tan x)^3$, and $g(x) = f^{-1}(x)$, find $g'(1)$. (Hint: First find $g(1)$.)

3. Let A be the area between the function $y = \frac{5}{x^2+1}$, the line $y = 1$, and the y-axis. Let V be the region formed by spinning A around the y-axis.

Set up two different integrals (one in x, one in y) which calculate the volume of V. Evaluate one of the integrals.

4. **Integrals!**

a) $\int \pi^\pi + \frac{e}{x} + \frac{\pi}{x^2}\, dx$

b) $\int \tan x\, dx$

c) $\int x \sin(x^2)\, dx$

Describe the most beautiful place you've ever seen.

5. In each expression below, find y':

a) $y = \ln(x^2)$

b) $\ln(xy) = y^2 + \sin x$

c) $y = \int_3^{\sin x} \frac{1}{t} dt$

d) $y = \frac{x \ln x}{\cos x}$

6. Find the area in the first quadrant between the curve $y = \cos x$ and $2x + \pi y = \pi$.

7. Here we see the region A between two functions f and g. Suppose A is rotated around the line $x = 6$. Give a formula which would calculate the resulting volume. Explain why your formula calculates the volume.

Extra Credit: 2004 was the 50th anniversary of the first successful climbing of Mt. Everest. Name the first two people to make it (and come down alive). Incidentally, global warming is melting 4 feet from Mt. Everest every year, making it easier to climb every year!