Math 125 G - Winter 2009
Mid-Term Exam Number One
January 29, 2009

Name: _____

Student ID number: _____ Section: _____

1	20	
2	10	
3	10	
4	10	
5	10	
6	10	
Total	70	

- Complete all questions.
- You may use a scientific calculator during this examination; graphing calculators and other electronic devices are not allowed and should be turned off for the duration of the exam.
- If you use trial-and-error, a guess-and-check method, or numerical approximation when an exact method is available, you will not receive full credit.
- You may use one double-sided, hand-written, 8.5 by 11 inch page of notes.
- Show all work for full credit.
- You have 80 minutes to complete the exam.

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1. Evaluate the following integrals.

(a) $\int \frac{\ln x}{x}\, dx$

(b) $\int_0^3 \sqrt{36 - 4x^2}\, dx$

(c) $\int x^9 \sqrt{x^5 + 3}\, dx$

(d) $\int \frac{x + 4}{x^2 + 1}\, dx$

2. Consider the region bounded by the curves $y = \sqrt{x}$ and $y = \frac{1}{2}x$. Find the volume of the solid of revolution created by revolving this region about the x-axis.

3. Consider the region in the first quadrant bounded by the y-axis and the curves $y = 2x$ and $y = \sqrt{1 - 5x^2}$. Find the volume of the solid of revolution created by revolving this region about the y-axis.

4. Give upper and lower bounds for the sum

$$\sum_{i=1}^{n} \frac{1}{i^2+1}$$

5. For $m > 0$, consider the region bounded by the curve $y = x^2$ and the lines $y = mx$ and $y = 2mx$. Find m so that this region has an area of 252.

6. Suppose a region in the plane is bounded by $y = f(x)$, $y = g(x)$, $x = a$ and $x = b$, with $0 < g(x) < f(x)$ and $a < b$. Show that the volume of the solid of revolution created by revolving this region about the line $y = -k$ (for $k > 0$) is a linear function of k (i.e., a function of the form $Ak + B$).