

Name (Last, First) \_\_\_\_\_ ID # \_\_\_\_\_

Signature \_\_\_\_\_

Lecturer \_\_\_\_\_ Section # \_\_\_\_\_

UNIVERSITY OF MASSACHUSETTS AMHERST  
DEPARTMENT OF MATHEMATICS AND STATISTICS

Math 132

Exam 1

February 21, 2008  
7:00-8:30 p.m.

**Instructions**

- **Turn off all cell phones and watch alarms!** Put away iPods, etc.
- There are five (5) questions.
- Do all work in this exam booklet. You may continue work to the backs of pages and the blank page at the end, but if you do so indicate where.
- Do not use any other paper except this exam booklet and the one-page “cheat sheet” that you prepared.
- Organize your work in an unambiguous order. Show all necessary steps.
- **Answers given without supporting work may receive 0 credit!**
- If you use your calculator to do numerical calculations, be sure to show the setup leading to what you are calculating.
- Be ready to show your UMass ID card when you hand in your exam booklet.

QUESTION	PER CENT	SCORE
1	20	
2	20	
3	20	
4	20	
5	20	
TOTAL	100	

1. ( $4 \times 5\% = 20\%$ ) Calculate each of the following. Explicitly show any relevant substitution or algebraic or trigonometric manipulation. In the case of a definite integral, give an exact value and *not* a numerical approximation.

(a)  $\int \frac{e^{3x}}{1 + e^{3x}} dx$

(b)  $\int \frac{\cos x}{\sqrt{2 - \sin x}} dx$

*Continued on next page  $\rightarrow$*

*Continuation of # 1.*

(c)  $\int_0^a x^2 \sqrt{x^3 + a^3} \, dx$

(d)  $\int \tan^2 x \, dx$

2. ( $2 \times 10\% = 20\%$ ) A rabbit population starts with 4 rabbits and increases at a rate of  $n'(t)$  rabbits per *week*.

(a) What does  $4 + \int_0^{26} n'(t) dt$  represent?

(b) If, actually,  $n'(t) = e^{t/10}$ , how many rabbits will there be after a *year*?

3. ( $4 \times 5\% = 20\%$ ) Evaluate each of the following expressions and give reasons for your answers:

(a)  $\int \left( \frac{d}{dx} \sqrt{(\ln x)^2 + 1} \right) dx$

(b)  $\frac{d}{dx} \left( \int_0^{\sqrt{e}} \sqrt{(\ln x)^2 + 1} dx \right)$

(c)  $\frac{d}{du} \left( \int_{\pi}^u \sqrt{(\ln x)^2 + 1} dx \right)$

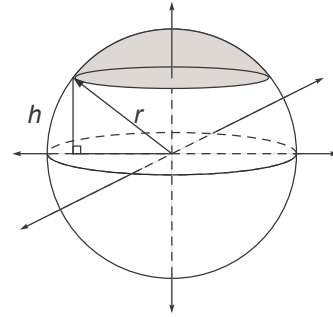
(d)  $\frac{d}{du} \left( \int_1^{\sin u} \sqrt{(\ln x)^2 + 1} dx \right)$

4. (20%) Calculate the exact area of the region enclosed by the graphs of:

$$y = x^3, \quad y = \sqrt{x}$$

Begin by sketching the two graphs and the region. On your sketch include a typical rectangular strip of width  $\Delta x$  or  $\Delta y$ , whichever you are using.

5. (20%) Compute the volume of the solid “cap” of a spherical ball of radius  $r$  consisting of all points whose height above the equator’s plane is at least  $h$ .



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