

Math 125H - Winter 2013

Exam 1

January 31, 2013

Name: _____

Section: _____

Student ID Number: _____

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- There are 5 pages of questions. Make sure your exam contains all these questions.
- You are allowed to use a scientific calculator (**no graphing calculators**) and one **hand-written** 8.5 by 11 inch page of notes.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit. **Put a box around your FINAL ANSWER for each problem and cross out any work that you don't want to be graded.** Give exact answers wherever possible.
- If you need more room, use the backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- Any student found engaging in academic misconduct will receive a score of 0 on this exam.
- You have 80 minutes to complete the exam. Budget your time wisely.
SPEND NO MORE THAN 15 MINUTES PER PAGE!

GOOD LUCK!

1. Evaluate the integrals.

(a) (6 pts) $\int \frac{xe^{x^2}}{e^{x^2} - 3} dx$

(b) (6 pts) $\int_{-1}^0 x^5 \sqrt[3]{1+x^3} dx$

2. (a) (5 pts) Find the exact value of $\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{2/n}{1 + 2i/n}$

(b) (7 pts) $\int_0^\pi |6 \cos(x/2) - 3| dx$

3. (a) (5 pts) Find all positive critical values for the function $f(t) = \int_{3t}^{\frac{1}{3}t^2} \frac{\sqrt{x-1}}{x} dx$

(b) (3 pts) Let $f(x)$ be a continuous function and evaluate the limit $\lim_{t \rightarrow a} \frac{\int_a^t f(x) dx}{t - a}$.

(c) (6 pts) Circle true or false for each of the following statements:

i. $\int_1^3 xf(x^2)dx = \int_1^3 \frac{1}{2}f(u)du$ TRUE FALSE

ii. Approximating $\int_1^3 x^2 dx$ using left-endpoints and 3-subdivisions
we obtain $L_3 = \frac{2}{3} + \left(\frac{5}{3}\right)^2 \frac{2}{3} + \left(\frac{7}{3}\right)^2 \frac{2}{3}$ TRUE FALSE

iii. $\frac{d}{dx} \left(x \int_a^b f(t)dt \right) = \int_a^b f(t)dt$ TRUE FALSE

4. (a) (7 pts) Consider the region R bounded between $y = x$ and $y = 6 - x^2$, and bounded on the left by the y -axis. (So the region is all within the first quadrant).

Set up definite integrals (DO NOT EVALUATE) for each of the quantities below:

i. The area of R :

ii. The volume of the solid obtained by rotating R the vertical line $x = 10$:

- (b) (7 points) Let R be the region below the curve $y = \frac{1}{x}$, above the x -axis, and between the vertical lines $x = 1$ and $x = 2$. The region R is rotated around the horizontal line $y = -a$ where a is positive and the resulting volume is 100 cubic units. Find the value of a .

5. (8 pts) A water balloon is dropped from the top of a building. You are standing exactly 300 feet directly below the water balloon when it is dropped and you plan to shoot an arrow straight up with an initial velocity of 60 feet/sec. Dr. Loveless' open window is 50 feet above you.

How long after the balloon is dropped should you fire your arrow so that it reaches the balloon precisely when it is outside Dr. Loveless' window? Assume both the balloon and the arrow accelerate at a constant 32 feet/sec^2 downward.