

Math 125 - Spring 2016

Exam 1

April 21, 2016

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 Ti-30x IIS Calculator model ONLY (**no other calculators allowed**). And you are allowed one **hand-written** 8.5 by 11 inch page of notes (front and back).
- Leave your answer in exact form. Simplify standard trig, inverse trig, natural logarithm, and root values. Here are several examples: you should write $\sqrt{4} = 2$ and $\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$ and $\frac{7}{2} - \frac{3}{5} = \frac{29}{10}$ and $\ln(1) = 0$ and $\tan^{-1}(1) = \frac{\pi}{4}$.
- 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.**
- If you need more room, use backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- There may be multiple versions of the exam so if you copy off a neighbor and put down the answers from another version we will know you cheated. Any student found engaging in academic misconduct will receive a score of 0 on this exam. All suspicious behavior will be reported to the student misconduct board.
DO NOT CHEAT OR DO ANYTHING THAT LOOKS SUSPICIOUS!
WE WILL REPORT YOU AND YOU MAY BE EXPELLED!
Keep your eyes down and on your paper. If your TA sees your eyes wandering they will warn you only once before taking your exam from you.
- You have 80 minutes to complete the exam. Budget your time wisely.
SPEND NO MORE THAN 10 MINUTES PER PAGE!

GOOD LUCK!

1. (11 pts) Evaluate the integrals.

(a) $\int \frac{x - 4\sqrt[3]{x}}{x^2} + \frac{5}{2\sqrt{x}} dx$

(b) $\int_{\sqrt{2}}^2 x^3 \left(\frac{1}{2}x^2 - 1 \right)^4 dx$

2. (11 pts) Evaluate the integrals.

(a) $\int \csc^2(x) + 4^x + \frac{\ln(x)}{x} dx$

(b) $\int_0^{\pi/4} \frac{\sin(2x)}{(\cos(2x) + 1)^3} dx$

3. (a) (5 pts) Consider $\lim_{n \rightarrow \infty} \sum_{i=1}^n \left(5 + \left(\frac{2i}{n} \right)^3 \right) \frac{2}{n}$. Rewrite this as an integral and evaluate.

(b) (8 pts) Consider the function $f(x) = \frac{1}{\sqrt{2\pi}} \int_0^x e^{-\frac{1}{2}t^2} dt$. Do NOT try to integrate, you can't!
(Aside: This is a very important function in probability and statistics).

i. Find the equation for the tangent line to $f(x)$ at $x = 0$. (Hint: First, find $f'(x)$).

ii. Estimate the value of $f(1) = \frac{1}{\sqrt{2\pi}} \int_0^1 e^{-\frac{1}{2}t^2} dt$ using the midpoint rule method and $n = 3$ subdivisions. You do not have to simplify your answer, just show me the expanded answer with all the correct numbers in the correct places.

4. (12 pts) The two parts below are not related.

- (a) The velocity of an object moving along a straight line is given by $v(t) = 10 \sin\left(\frac{\pi}{2}t\right)$ miles/hour. Find the **total distance** traveled by the object from $t = 0$ to $t = 3$ hours.

- (b) At time $t = 0$ seconds, a small water balloon is thrown downward from the top of a tall building toward the ground (where your math instructor happens to be sitting). At $t = \frac{1}{2}$ second, the balloon is 90 feet above the ground. At $t = 2$ seconds, the balloon hits the ground. Assume acceleration is a constant 32 feet/second² downward. At what velocity does the water balloon hit the ground?

5. (13 pts) Consider the region R bounded by $y = 6x - x^2$ and $y = 2x$.

(a) Draw the region R and find the area.

(b) Set up an integral that represents the volume of the solid obtained by rotating the region R about the x -axis.
(DO NOT EVALUATE)

(c) Set up an integral that represents the volume of the solid obtained by rotating the region R about the **vertical** line $x = 8$.
(DO NOT EVALUATE)