

Math 125 - Winter 2015

Exam 1

January 29, 2015

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.**
- Leave your answer in exact form. Simplify standard trig, inverse trig, natural logarithm, and root values. For example, don't leave your answer in the form $\sqrt{4}$ or $\cos(\pi/4)$ instead write $\sqrt{4} = 2$ and $\cos(\pi/4) = \sqrt{2}/2$. But otherwise, you do not have to simplify.
- 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) (5 pts) $\int \frac{2\sqrt{x} - 6x^2 + 3x^4}{2x^4} dx$

(b) (6 pts) $\int_{\pi/6}^{\pi/2} \frac{\cos(x)}{3 - 2\sin(x)} dx$

2. Evaluate the integrals.

(a) (5 pts) $\int x\sqrt{x-2} dx$

(b) (6 pts) $\int_{-1}^0 \frac{x^3}{x^8+1} dx$ (Hint: What function has a derivative that looks like x^3 ?)

3. The two parts below are not related.

- (a) (6 pts) Your physics instructor gives you a function, $f(x)$, defined by $f(x) = \int_{-3x}^{x^2} e^{t^2} dt$. Find the slope of the tangent line to $f(x)$ at $x = 1$.

- (b) (6 pts) A particle is traveling up and down along a straight line with velocity given by $v(t) = 4t^3 - 4t$ ft/sec at time t seconds.
Find the **total distance** traveled by the particle from $t = 0$ to $t = 2$.

4. The two parts below are not related.

(a) (6 pts) Use the Midpoint Rule with $n = 3$ subdivisions to approximate the value of the integral $\int_2^8 \sqrt{1+x^2} dx$. (Leave your answer expanded out, you don't need to simplify).

(b) (6 pts) You are standing on the edge of a building 100 feet above a path (your instructor happens to be walking on the path). At what initial downward velocity would you have to 'accidentally' throw a water balloon in order for it to hit the path in 2 seconds? Assume acceleration is a constant 32 feet/second downward.

5. Consider the region, R , bounded between $y = \sqrt{x}$, the **horizontal** line $y = 2$, and the y -axis.
- (a) (6 pts) Find a value of b , such that the **horizontal** line $y = b$ divides the region, R , into two regions of equal area.
- (b) (4 pts) Use cross-sectional slicing (*i.e.* discs/washers) to 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) (4 pts) Use the method of cylindrical shells to set up an integral that represents the volume of the solid obtained by rotating the region R about the **horizontal** line $y = 5$.
(DO NOT EVALUATE)