Math 125 - Winter 2017

Exam 1

January 26, 2017

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. (10 pts) Evaluate the integrals.

(a) $\displaystyle\int 3x^4 + \frac{5}{2x} - \sqrt{\frac{9}{x^3}} + \cos(4x)\ dx$

(b) $\displaystyle\int_0^{16} |3\sqrt{x} - 6| dx$

2. (15 pts)

(a) Evaluate $\displaystyle\int \frac{\sin(t)}{\cos^2(\cos(t))}\, dt$

(b) Evaluate $\displaystyle\int_1^4 \frac{e^{(1-\sqrt{x})}}{6\sqrt{x}}\, dx$

(c) A particular function $y = f(x)$ satisfies the following: $\displaystyle\int_0^6 f(w)\, dw = 12$ and $\displaystyle\int_0^5 f(u)\, du = 4$.

Find the value of $\displaystyle\int_5^6 2f(x) + 10\, dx \ + \ \int_0^2 f(3t)\, dt$

3. (13 pts)

(a) Use the right-endpoint method with $n = 4$ subdivision to approximate $\int_1^3 \ln(2t+1)\,dt$. (Leave your answer expanded out with all the correct numbers in the correct places).

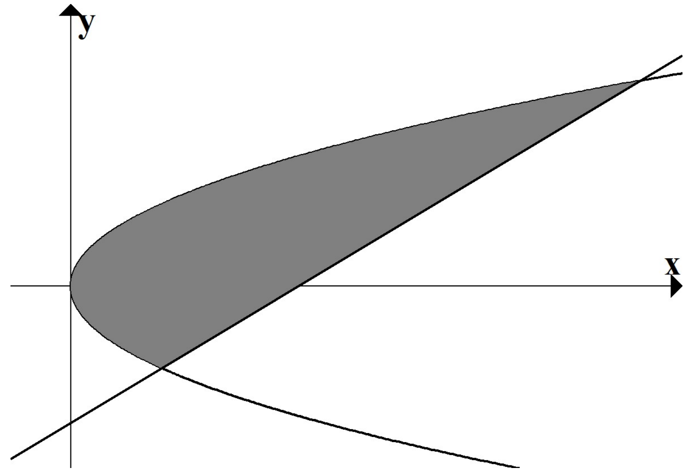
(b) Using the right-endpoint method with n subdivisions, write out the general pattern in terms of i and n for the Riemann sum for $\int_1^3 \ln(2t+1)\,dt$. (*i.e.* fill in the pattern in the space provided after the sigma sign below).

Answer: $\displaystyle\int_1^3 \ln(2t+1)\,dt = \lim_{n\to\infty} \sum_{i=1}^{n}$

(c) A water balloon is thrown downward from a dorm window. After 2 seconds, the balloon *coincidentally* hits the ground right next your math instructor. Your math instructor estimates the balloon hit the ground at a (downward) speed of 80 ft/sec. At what height is the window from which the balloon was thrown? (Assume acceleration is a constant 32 ft/sec^2 downward).

4. (11 pts) For all parts, consider the region R bounded by $y = \sqrt{x}$, $y = -\sqrt{x}$ and $x = 3y + 10$.

(a) Set up an integral for the area of the region R. (Just set up, DO NOT EVALUATE)



(b) Set up an integral that represents the volume of the solid obtained by rotating the region R about the y-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 $x = 25$. (DO NOT EVALUATE)

5. (11 pts) The two parts below are not related.

(a) The distance traveled by a bike on a certain track is $F(x) = \int_0^{2x} \sqrt{\dfrac{1}{3-\cos(t)}}\, dt$ where x is in seconds and $F(x)$ is in feet. Find the speed of the bike at $t = \pi$ seconds (include units).

(b) Consider the region under the curve $y = \dfrac{1}{x^2}$, above the x-axis, and between $x = 1$ and $x = 9$. Find the number b such that the **horizontal** line $y = b$ bisects this region.