Math 125 - Fall 2017
Exam 1
October 19, 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. (14 pts) Evaluate the integrals. In part (c), appropriately change bounds and simplify your final answer.

   (a) $\displaystyle\int 7 - e^{-6x} + \frac{5}{2\sqrt[3]{x}}\,dx$

   (b) $\displaystyle\int \frac{\sin(2x)}{\cos(2x)+3}\,dx$

   (c) $\displaystyle\int_0^1 \frac{\sqrt{1+\frac{12}{\pi}\tan^{-1}(x)}}{(1+x^2)}\,dx$

2. (12 pts)

(a) Evaluate: $\displaystyle\int_0^1 \frac{x^7}{(1+x^4)^2}\,dx$

(b) A table of values for an increasing function f are given:

x	3	3.5	4	4.5	5	5.5	6
$f(x)$	1	3	6	9	12	15	20

i. Approximate the value of $\displaystyle\int_3^5 f(x)\,dx$ using left-endpoints with $n=4$ subdivisions.

ii. Let $g(x) = \displaystyle\int_3^{x^2+x} f(t)\,dt$. Find the value of the *derivative* of $g(x)$ at $x=2$.
That is, compute $g'(2)$.

3. (14 pts)

(a) Let R be the region bounded by $y = x^3$, $x = 2$ and the x-axis. Set up (DO NOT EVALUATE) integrals that represent the volume of the solid obtained by rotating R about the given axis:

i. ... about the y-axis:

ii. ... about the **horizontal** line $y = -2$ using dx:

iii. ... about the **horizontal** line $y = -2$ using dy:

(b) Compute the **area** of the region bounded by $y^2 + x - 2 = 0$ and $x = y$.
(Note: This is a new region, unrelated to the previous question).

4. (10 pts) The acceleration function (in m/s^2) and the initial velocity, $v(0)$, of a certain particle moving along a line are given by: $a(t) = 2t + 6$ and $v(0) = -7$.
   Find the **<u>total</u> distance** traveled by the particle from $t = 0$ to $t = 2$ seconds.
   (Hint: First find the velocity function!)

5. (10 pts) At time $t = 0$ seconds a small water balloon is **dropped** from the top of a building (so $v(0) = 0$ ft/sec). Dr. Loveless looks up and observes the following:

   - At some time, $t = a$ seconds, the balloon passes a window that is 112 feet high.
   - One second later, $t = a + 1$ seconds, the balloon hits the ground at his feet.

   Assume the balloon fell toward the ground at a constant acceleration of -32 ft/sec^2.
   How tall is the building?