Math 125 - Winter 2019
Exam 1
January 31, 2019

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.
- You have 80 minutes to complete the exam. Budget your time wisely.
SPEND NO MORE THAN 10 MINUTES PER PAGE!

GOOD LUCK!

1. (13 pts) Evaluate the integrals. If you do a substitution in a definite integral problem, you must show me that you can appropriately change the bounds to get full credit. **Simplify your final answers**.

(a) $\displaystyle\int \frac{5}{e^{2x}} + 13 - \frac{\sqrt{9x^5}}{7\sqrt{x}}\, dx$

(b) $\displaystyle\int \frac{x^2 \sec^2(x^3)}{\tan^5(x^3)}\, dx$

(c) $\displaystyle\int_1^{e^8} \frac{\sqrt[3]{\ln(x)}}{x}\, dx$

2. (10 pts) (The two problems below are NOT related). **Simplify your final answers**.

(a) Evaluate $\displaystyle\int \frac{x}{(4+2x)^2}\,dx$

(b) Find the area of the region bounded by $x = 3y$ and $y = \sqrt{x}$.

3. (13 pts) Leave your answers in exact form, but **simplify your final answers**.

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

(b) Consider $g(x) = \int_0^x 2t + t\sin(\pi t^2)\, dt$.

i. Find $g'(1)$.

ii. Evaluate $g(1)$.

iii. Give the equation for the tangent line to $g(x)$ at $x = 1$.
(Write your answer in the form $y = mx + b$)

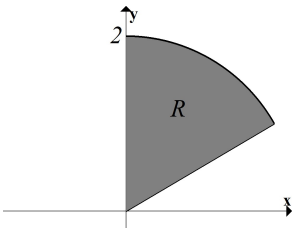
4. (12 pts) (The two problems below are NOT related).

(a) Find $f(x)$, if $f''(x) = 28\sqrt[3]{x} - 6x$, $f(0) = 5$ and $f(1) = 10$. Put a box around your answer.

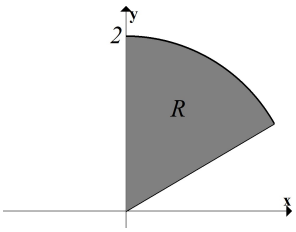
(b) Compute $\displaystyle\int_1^8 \left|1 - \frac{16}{x^2}\right| dx$

5. (12 pts) Consider the region, R, in the first quadrant that is bounded by the y-axis, the circle $x^2 + y^2 = 4$, and the line $\sqrt{3}y = x$ (shown below). You are given the picture multiple times for ease of labeling. Use any correct method.

   (a) Set up (but DO NOT EVALUATE) an integral for the volume of the solid obtained by rotating R about the x-axis.



   (b) Set up (but DO NOT EVALUATE) an integral for the volume of the solid obtained by rotating R about the horizontal line $y = 2$.



   (c) Find the volume of the solid obtained by rotating R about the y-axis. Hint: Shells! **Set-up AND evaluate**.