Math 125
Exam 1
October 17, 2024

Name _____

Student ID #_____ Section _____

HONOR STATEMENT

"I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam."

SIGNATURE:_____

- This exam consists of a cover, a scratch sheet, five pages of questions, and another scratch sheet. If you put work on either scratch sheet and you want it to be graded, then you must clearly tell us in the problem to "see first scratch page" or "see last scratch page".
- You will have 80 minutes.
- On several questions, a final answer line is provided, please put your answer there. If there is no final answer line, then put a box around your final answer.
- You are allowed to use a Ti-30x IIS Calculator model ONLY (**no other calculators allowed**) and one 8.5 by 11 inch sheet of handwritten notes (front and back). All other sources are forbidden.
- Turn your cell phone OFF and put it away for the duration of the exam. You may not listen to headphones or earbuds during the exam.
- **You must show your work.** The correct answer with no supporting work may result in no credit.
- 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 $\ln(1) = 0$ and $\tan^{-1}(1) = \frac{\pi}{4}$.
- Unless otherwise indicated, when rounding is necessary, you may round your final answer to two digits after the decimal.
- **Do not write within 1 centimeter of the edge!** Your exam will be scanned for grading.
- There may be multiple versions, you have signed an honor statement, and cheating is a hassle for everyone involved. If we find that you give an answer that is only appropriate for the other version of the exam and there is no work to support your answer, then you will get a zero on the entire exam and your work will be submitted to the academic misconduct board. JUST DO NOT CHEAT.

GOOD LUCK!

You may use this page for scratch-work or extra room.
All work on this page will be ignored unless you write and circle "see first scratch page" on the problem and you label your work.

1. (13 pts) Parts (a), (b), and (c) are not related.

   (a) (4 pts) Evaluate $\int \frac{(x+3)(x-3)}{\sqrt{x}} + \sec(2x)\tan(2x)\,dx$

   Answer = _____

   (b) (5 pts) Evaluate $\int \frac{e^x\,(e^x+2)}{e^x-1}\,dx$

   Answer = _____

   (c) (4 pts) Express the following Riemann sum as a definite integral: $\lim_{n\to\infty} \sum_{i=1}^{n} \frac{1}{5+\sqrt{1+\frac{3i}{n}}} \cdot \frac{3}{n}$.

   Do NOT evaluate, just give the integral.

   Integral = _____

2. (9 pts) Parts (a) and (b) are not related.

(a) (4 pts) Let $g(x) = \int_{\frac{x}{\pi}}^{\tan(x)} 6\sqrt{t}\, dt$. Find the derivative of $g(x)$ at $x = \pi/4$.

Simplify the final answer as much as possible.

$g'(\pi/4) =$ _____

(b) (5 pts) Use substitution to evaluate the following integral: $\int_2^3 x\sqrt[3]{x-2}\, dx$

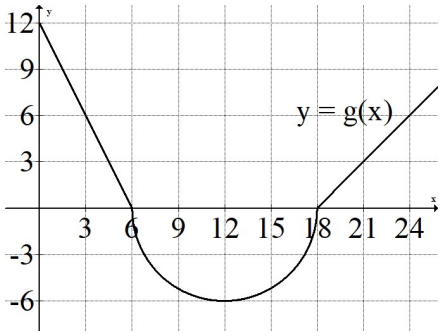
Show your work in correctly changing the bounds.

Answer = _____

3. (14 pts) Part (a) and (b) below not related.

(a) (8 pts) The graph of $g(x)$ shown consists of two straight lines and a semicircle. Let $f(x) = \int_0^x g(t)\,dt$ and answer the following questions.

i. Use the graph to compute the values:



(1) $f(12) =$ _____

(2) $f'(21) =$ _____

(3) $f''(3) =$ _____

ii. At what value of x does $f(x)$ have a local max?

$x =$ _____

(b) (6 pts) Consider the region, R, bounded by $y = \sqrt{x}$, $x = 4$ and the x-axis. Find the area of this region. Then find the value of a such that vertical line $x = a$ divides this region in half.

Total Area of the Entire Region = _____

Value of a = _____

4. (12 pts) Parts (a) and (b) below are not related.

   (a) (6 pts) Evaluate $\int_1^4 \left| \frac{2x^3 - 16}{x^2} \right| dx$

Answer = _____

   (b) (6 pts) A tomato is thrown downward from the top of a 90 foot building **on the moon**. At $t = 2$ seconds, the tomato hits the ground. Assume the tomato accelerates at a constant 5 feet/sec^2 downward on the moon and assume there is no air resistance.

   Find the function for the height, $h(t)$, of the tomato above the ground t seconds after being thrown and give the initial velocity of the tomato in feet/sec.

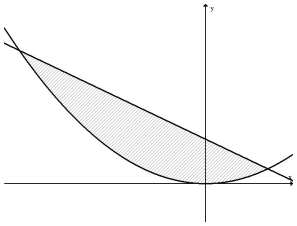
$h(t)$ = _____

Initial velocity = $v(0)$ = _____ feet/sec

5. (12 pts) **For all parts below**, consider the region bounded by $y = x^2$ and $y = 3 - 2x$, shown below.

   Please be clear about your bounds and integrands in each set-up.

   (a) (1 pt) Find the two (x, y) points of intersection of these curves.



   List both: $(x, y) =$ _____

   (b) (3 pts) Set up an integral (using dx) that represent the **AREA** of this region. Include the correct bounds. (Do NOT evaluate).

   Area (using dx) =

   (c) (4 pts) Set up integrals (using dy) that represent the **AREA** of this region. This will require you add two integrals. (Do NOT evaluate).

   Area (using dy) first integral =

   +

   Area (using dy) second integral =

   (d) (4 pts) Set up an integral for the **VOLUME** of the solid obtained by rotating R about horizontal line $y = -2$. (Do NOT evaluate).

   Volume =

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