Math 125 - Winter 2019
Exam 2
Feb. 28, 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 $\tan^{-1}(1) = \frac{\pi}{4}$. Also an answer containing an inverse trig inside of a trig function (such as $\cos(\sin^{-1}(x))$ or $\sin(2\cos^{-1}(x))$) is not acceptable, instead simplify using the triangle method from class.
- 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. (12 pts) Evaluate

(a) $\int \frac{1}{\sqrt{x^2 - 6x + 13}}\, dx$

(b) $\int \frac{x^2 - 3x + 8}{x^2(x - 2)}\, dx$

2. (12 pts) Evaluate

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

(b) $\int \frac{\tan^3(x)}{\cos^4(x)}\, dx$

3. (12 pts) Evaluate

(a) $\int \cos(\sqrt{x})\, dx$

(b) $\int \frac{x^2}{\sqrt{9-x^2}}\, dx$

4. (12 pts) Answer the following questions:

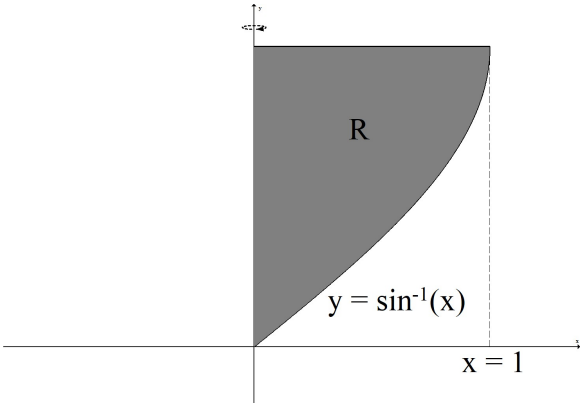
(a) Find the average value of $f(x) = \dfrac{\sin(x)e^{\cos(x)}}{\left(e^{\cos(x)}+1\right)^2}$ on the interval $x = 0$ to $x = \pi/2$.

(b) Evaluate the ***improper integral***: $\displaystyle\int_1^2 \frac{x}{\sqrt[4]{x-1}}dx$.
(You must show your work evaluating a limit. If it converges give the value. If it diverges, then say so.).

5. (10 pts) Consider the region R in the first quadrant of the xy-plane bounded by $y = \sin^{-1}(x)$ and the y-axis (*the region is shaded in the picture below*). A water tank is formed by rotating this region about the y-axis. The tank starts full of water.

   All lengths are in meters. Recall the density of water is 1000 kg/m^3 and gravity is 9.8 m/s^2.

   (a) Set up (DO NOT EVALUATE) an integral for the work required to pump all the water to the top of the tank.



   (b) Use Simpson's rule with $n = 4$ to approximate your integral from part (a). Show some work in your calculations and give a final answer rounded the nearest Joule.