Math 125 - Winter 2018
Exam 1
January 25, 2018

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) $\displaystyle\int_0^{\pi/6} \frac{\sin(2x)}{(\cos(2x))^4}\,dx$

   (b) $\displaystyle\int x^3\sqrt{x^2+5}\,dx$

2. (12 pts) (The two problems below are NOT related)

(a) Evaluate $\int_0^3 |6x^2 + 6x - 12|\, dx$

(b) Let $g(x) = \int_{2x^2}^{10} \sin(\pi t^2)\, dt$. Compute $g'(1/2)$.

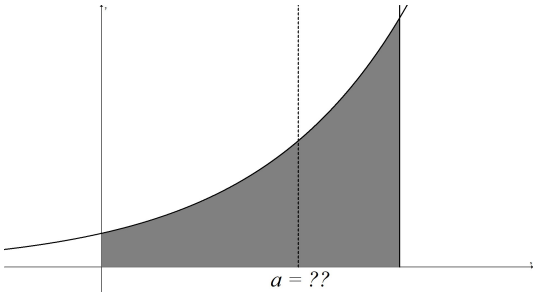
3. (11 pts) (The two problems below are NOT related)

(a) If $\int_0^4 f'(x)\,dx = 10$, $\int_3^4 f'(x)\,dx = 2$, and $f(3) = 13$, then what is the value of $f(0)$?

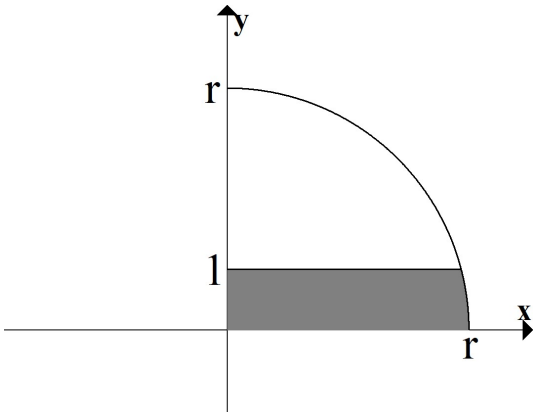
(b) A tomato is thrown downward from the top of a tall building. At $t = 3$ seconds after being thrown, the tomato is at a height of 240 feet and is traveling at a *downward* velocity of 110 feet/sec. Assume the acceleration of the tomato due to gravity is $a(t) = -32$ ft/sec^2.
Find the height of the building.

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

(a) Consider the region bounded by $y = e^x$, $y = 0$, $x = 0$ and $x = 2$. Find the value of a such that the vertical line $x = a$ divides this region into two sub-regions of equal area.

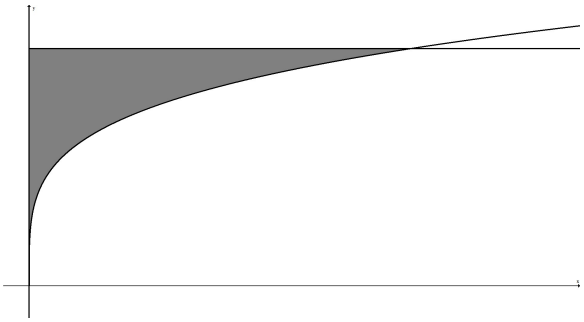


(b) Suppose r is a number bigger than 1. Let A be the region in the first quadrant that is below $y = 1$ and inside the circle $x^2 + y^2 = r^2$. Find the volume of the solid obtained by rotating A about the y-axis. (Answer will involve r).



5. (12 pts) Let R be the region bounded by $y = 3$, $x = 0$ and $y = 3\sqrt[4]{x}$ (shown below).

(a) Find the area of this region.



(b) A solid is obtained by rotating the region R around the **vertical** line $x = 1$. Set up the integrals for the volume of this solid using BOTH the method of cylindrical shells and the method of washers (DO NOT EVALUATE).

Shells:

Washers: