Math 116 — Practice for Exam 1

Generated September 28, 2015

Name: _____

Instructor: _____ Section Number: _____

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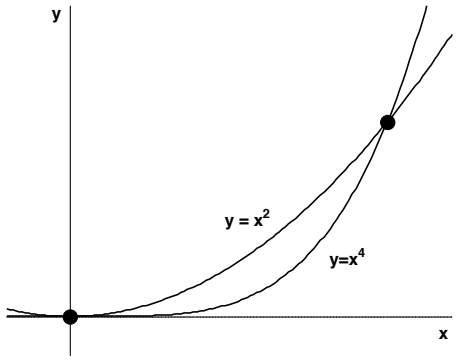
1. This exam has 4 questions. Note that the problems are not of equal difficulty, so you may want to skip over and return to a problem on which you are stuck.
2. Do not separate the pages of the exam. If any pages do become separated, write your name on them and point them out to your instructor when you hand in the exam.
3. Please read the instructions for each individual exercise carefully. One of the skills being tested on this exam is your ability to interpret questions, so instructors will not answer questions about exam problems during the exam.
4. Show an appropriate amount of work (including appropriate explanation) for each exercise so that the graders can see not only the answer but also how you obtained it. Include units in your answers where appropriate.
5. You may use any calculator except a TI-92 (or other calculator with a full alphanumeric keypad). However, you must show work for any calculation which we have learned how to do in this course. You are also allowed two sides of a $3'' \times 5''$ note card.
6. If you use graphs or tables to obtain an answer, be certain to include an explanation and sketch of the graph, and to write out the entries of the table that you use.
7. You must use the methods learned in this course to solve all problems.

Semester	Exam	Problem	Name	Points	Score
Winter 2010	1	10		15	
Winter 2011	1	6		12	
Winter 2015	1	2	dog bowl	13	
Fall 2014	1	7	board game	13	
Total				53	

Recommended time (based on points): 48 minutes

10. [15 points] Consider the area between the curves $y = x^2$ and $y = x^4$ in the positive quadrant as shown in the graph below. Use this area to answer the following questions.

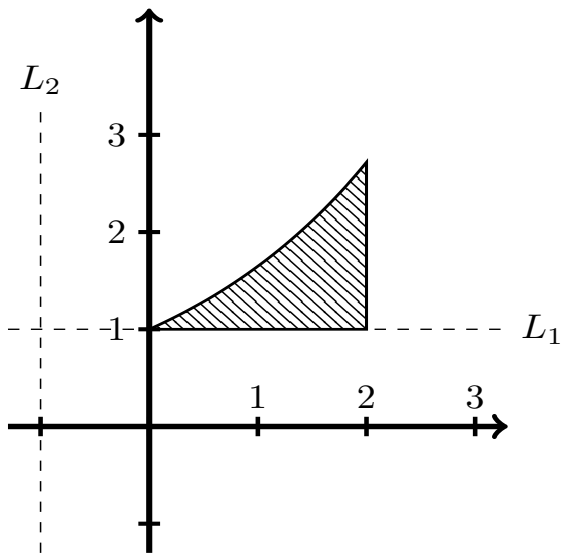


a. [5 points] Set up, but do not evaluate, a definite integral that describes the area described above. Write your final answer on the space provided.

b. [5 points] Set up, but do not evaluate, a definite integral that describes the volume of the solid generated by revolving the area described above about the line $y = 2$. Write your final answer on the space provided.

c. [5 points] Set up, but do not evaluate, a definite integral that describes the volume of the solid whose base is the area described above and whose cross-sections perpendicular to the x-axis are squares.

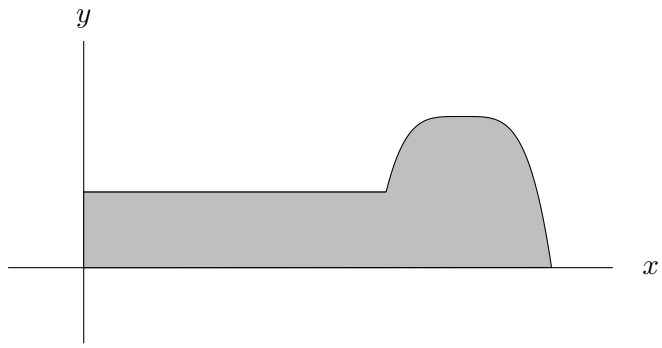
6. [12 points]
The region bounded by the graph of $y = e^{0.5x}$, the line $y = 1$, and the line $x = 2$ is shown below. For each of the lines L_1 and L_2 write a definite integral that represents the volume of the solid object obtained by rotating the region around that line. You do not need to show your work or calculate the value of the integral.



a. [6 points] L_1:

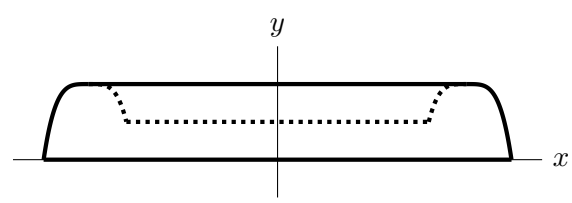
b. [6 points] L_2:

2. [13 points] Fred is designing a plastic bowl for his dog, Fido. Fred makes the bowl in the shape of a solid formed by rotating a region in the xy-plane around the y-axis. The region, shaded in the figure below, is bounded by the x-axis, the y-axis, the line $y = 1$ for $0 \leq x \leq 4$, and the curve $y = -(x-5)^4 + 2$ for $4 \leq x \leq 2^{1/4} + 5$. Assume the units of x and y are inches.



a. [7 points] Write an expression involving one or more integrals which gives the volume of plastic needed to make Fido's bowl. What are the units of your expression?

b. [6 points] Fred wants to wrap a ribbon around the bowl before he gives it to Fido as a gift. The figure below depicts the cross section of the bowl obtained by cutting it in half across its diameter. The thick solid curve is the ribbon running around this cross section, and the dotted curve is the outline of the cross section which is not in contact with the ribbon. Write an expression involving one or more integrals which gives the length of the thick solid curve in the figure (the length of ribbon Fred needs to wrap the bowl).



7. [13 points] Kazilla is designing a new board game. She is interested in using the region R in the xy-plane bounded by $y = 2$, $y = x$, $x = 1$ and $x = 0$.

a. [4 points] The first part of the game is a spinning top formed by rotating the region R around the y-axis. Write an integral (or a sum of integrals) that gives the volume of the spinning top. Do not evaluate your integral(s).

b. [4 points] Another game piece has a base in the shape R, but with semicircular cross sections **perpendicular** to the x-axis. Write an integral which gives the volume of the game piece. Do not evaluate your integral.

c. [5 points] A third game piece has volume given by $\int_0^2 \pi(h(x))^2 dx$ where $h(x)$ is a continuous function of x. Use MID(3) to approximate the volume of this third game piece. Be sure to write out all of the terms in your approximation. Your answer may contain the function $h(x)$.