

MATH 116 — PRACTICE FOR EXAM 1

Generated September 30, 2015

NAME: _____

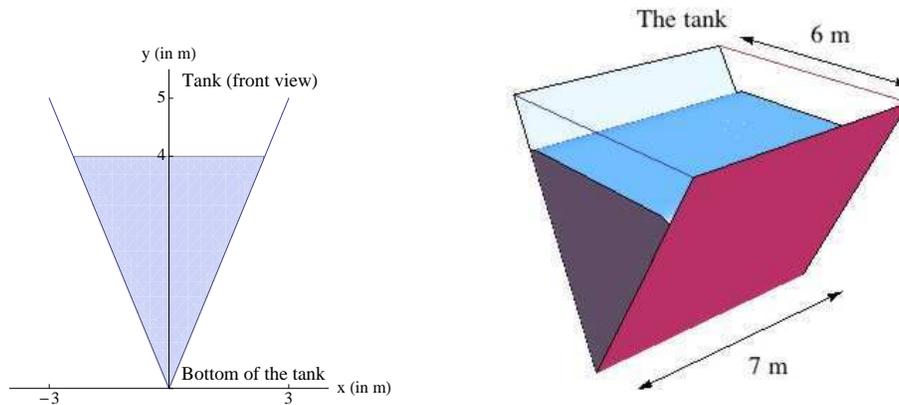
INSTRUCTOR: _____ SECTION NUMBER: _____

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
Fall 2013	1	6	triangular tank	11	
Winter 2014	1	7	drag queens	8	
Winter 2014	3	10	punchbowl	10	
Winter 2015	1	8	shark	9	
Total				38	

Recommended time (based on points): 37 minutes

6. [11 points] The Math Department has recently acquired a triangular storage tank 6 m wide, 5 m tall and 7 m long, which it will use to store coffee for its graduate students. The tank currently contains a special coffee blend, with a mass density 1033 kg per m^3 , up to a depth of 4 m.



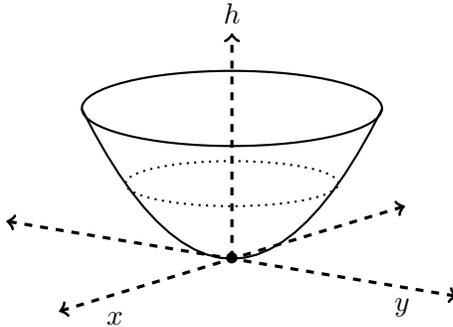
- a. [8 points] Write an expression that approximates the work done in lifting a horizontal slice of the liquid in the tank that is y meters above the bottom of the tank, with thickness Δy , to the top of the tank. Use $g = 9.8 \text{ m per s}^2$ for the acceleration due to gravity.

- b. [3 points] While grading this exam, the grad students will need coffee. Find a definite integral that computes the work required to pump all the coffee to the top of the tank. Give the units of this integral. You do not need to evaluate it.

7. [8 points] Alyssa Edwards wants to play a prank on Coco Montrese by spilling a bucket of orange cheese powder on her. To do this Alyssa lifts the bucket at a constant speed from the ground to a height of 10 meters. Unfortunately the bucket has a small hole and the cheese begins leaking out at a constant rate as soon as the bucket leaves the ground. The bucket initially weighs 10kg and when it reaches a height of 10 meters it only weighs 5kg. Recall the gravitational constant is $g = 9.8\text{m/s}^2$.
- a. [3 points] Write an expression giving the mass of the bucket $m(h)$ when the bucket is h meters above the ground.

- b. [5 points] How much work is required to lift the bucket from the ground to a height of 10 meters? Include units.

10. [10 points] Martin is having a party to celebrate the beginning of spring and he is serving punch out of a parabolic punch bowl. The bowl is sitting on a table (the xy -plane) as depicted in the figure below. At a height h above the table, the cross section of the bowl perpendicular to the h -axis is a circle with equation, $h = 4x^2 + 4y^2$. The punch bowl is 1 meter tall. Assume the units of x , y , and h are in meters and the density of the punch is 1200 kg/m^3 . Recall the gravitational constant is $g = 9.8 \text{ m/s}^2$.



- a. [5 points] Write an expression for the mass of a slice of punch of thickness Δh meters at a height h meters above the table.
- b. [5 points] Assuming the bowl is filled with punch up to a height of $h = 1/2$, write an integral which gives the amount of work needed to lift all of the punch over the rim of the bowl. Do not evaluate your integral.

8. [9 points] Sally, the marine scientist, is reeling in a large shark she caught onto her boat. The edge of her boat lies 5 meters above the water as shown in the figure below. The total length of the sharking line is 30 meters. The shark weighs 500 newtons in water, and her sharking line weighs 30 newtons per meter out of water, and 10 newtons per meter in water. The figure below depicts this situation - the sharking line is the thick dark line and the boat is shaded. Write an expression which gives the work Sally does pulling the shark's snout to the surface of the water.

