Third Examination, Second Try

Monday, November 7, 2011

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. Each entire problem is worth 25 points. You may keep this exam sheet.

Note: Figures corresponding to these problems may be drawn on the board.

1. An oil storage tank is in the shape of an inverted hemisphere of radius 10 feet. How many cubic feet of oil are in the tank if it is filled to within 5 feet of the top?

   Hints: See the diagram on the board. Treat the inverted hemisphere as a solid of revolution.

2. Give inequalities in polar coordinates that describe the flat surface of a washer that is 2 centimeters in diameter and that has a hole one centimeter in diameter in its center.

3. Suppose we have an oil storage tank in the shape of an upright cylinder 10 feet in diameter. What is the total force on the bottom and side surface of the tank if the oil is filled to 5 feet deep? Suppose this particular oil weighs 50 pounds per cubic foot at the temperature at which it is being held.

4. A rod has density $\delta(x) = 1 - e^{-x}$, $0 \leq x \leq 1$. Find the center of gravity of the rod.