MATH 2130 Section A01 Summer 2012 Term Test 3

You have 70 min to solve 5 problems. Please note

- **Write your name/student id clearly**
- **Illegible work will have marks removed. If I have trouble reading your work, it will not be marked.**
- **Write only on one side of the paper in the space design for it. If you require more space, CLEARLY indicate that you are continuing on the back.**
- **The last page of the exam is for calculations or scrap work. You may remove it, but be careful not to remove the staple. This page will NOT be marked.**
- **No calculators or any outside materials other than a pencil are permitted.**
- **The examination is out of 40 marks. Question values are given in brackets beside each question.**
- **You must show your work unless otherwise indicated.**

Good luck!

Surname: ______________________________

Given Name: ______________________________

Student ID: ______________________________

1. A square of side length $2\sqrt{2}$ is submerged in a liquid with constant density ρ, with one diagonal vertical and the upper most vertex on the surface. Find the force due to fluid pressure of on one side of the square. [6]

2. Let a thin plate have edges defined by the region in the first quadrant bounded by $y = 0, y = x$ and $x^2 + y^2 = 1$. Let the mass per unit area ρ be the distance from the point to the origin.

   (a) Find the mass of the plate. [5]

   (b) Find the first moment of the plate about the x-axis. [5]

(c) Given that the first moment of the plate about the y-axis is $1/(4\sqrt{2})$, find the center of mass. [2]

(d) SET UP BUT DO NOT INTEGRATE a double iterated integral (or double iterated integrals) in polar coordinates to find the moment of inertia about the line $y = 2 - x$. [5]

3. SET UP BUT DO NOT INTEGRATE a double iterated integral (or double iterated integrals) in cartesian coordinates to find the surface area of $y = z^2 + x$ inside the half cylinder $x^2 + y^2 = 4, y \geq 0$. (Be aware of the domain of the function) [5]

4. Let R be the part of the cardiod $r = 1 + \cos\theta$ above the x-axis. Find the volume of R rotated about the x-axis. [5]

5. Evaluate $\iiint_V dV$ where V is the region bounded by $z = 0, x^2+y^2 = 1$ and $x+y+z = 2$. [7]

THIS PAGE IS FOR SCRAP WORK.