FOURTH PRACTICE MIDTERM A
MATH 18.02, MIT, AUTUMN 12

You have 50 minutes. This test is closed book, closed notes, no calculators.

There are 5 problems, and the total number of points is 100. Show all your work. *Please make your work as clear and easy to follow as possible.*

Name:_____

Signature:_____

Student ID #:_____

Recitation instructor:_____

Recitation Number+Time:_____

Problem	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

1. (20pts) Let D be the domain in the first octant cut off by the plane $3x + 2y + z = 1$. Assume the density $\delta = z$.
(a) Set up an iterated integral in rectangular coordinates for the total mass of D.

(b) Evaluate only the inner integral

2. (20pts) A solid hemisphere has radius a and density 1 and it is placed so its flat side is on the xy-plane, with the centre at $(0, 0)$. Set up and evaluate a triple integral in spherical coordinates which gives its gravitational attraction on a unit point mass at the origin $(0, 0, 0)$.

3. (20pts) Consider the surface S given by the equation

$$z = (x^2 + y^2 + z^2)^2.$$

(a) Show that S lies in the upper half space $z \geq 0$.

(b) Write out the equation for this surface in spherical coordinates.

(c) Write down an iterated integral for the volume of the region inside S.

4. (20pts) Let S be the portion of the ellipsoid $x^2 + y^2 + 3z^2 = 1$ that lies above the xy-plane. Let

$$\vec{F} = (x + y^3)\hat{\imath} + (2y - e^x)\hat{\jmath} - (3z + 1)\hat{k}.$$

Compute the flux of $\vec{F}$ through S (orient S upwards).

5. (20pts) Let S be the part of the surface $z = xy$ where $x^2 + y^2 < 1$. Compute the flux of

$$\vec{F} = y\hat{\imath} + x\hat{\jmath} + z\hat{k},$$

upward across S.