**Multivariable Calculus - Test 2**

**Spring 2016**

Answers

**Part 1**

Evaluate where is the region in the first quadrant inside the circle: between the

-axis and the line ..



We describe in polar coordinates:

Then,

**Part 2**

Let be the region in bounded by the following four planes: ; ; ; and, .

1. Give a triple integral describing the volume of .
2. Evaluate this integral.



1. We describe as:

So we get:

**Part 3**

1. Let be a function and let be a curve in the plane. What is the definition of ?

There are other formulations that would be acceptable.

1. Evaluate where is the line segment in between and (6,1,4).

We parameterize by:

Here . So we get

**Part 4**

Let be the surface which is that part of the sphere above the -plane and below the plane . Give a surface integral and iterated integrals describing the surface area of . You **do not** need to evaluate this integral.



Surface Area is given by

We describe as a bit of a sphere as follows:

To find the bounds, we note that the plane is described in spherical coordinates as:

So, on this plane we have:

So, our bounds are given by:

So,

**Part 5**

Let be the region bounded by the planes: ; and . Assume density is proportional to the distance from the plane. It is a fact that the center of mass is on the axis. Find the center of mass.



We can take as the density function in this case: . Since we are told that the center of mass is on the z-axis, we know that . So, we need to find where and . To describe we use cylindrical coordinates: The bounds are given by:

Then:

And,

So, . So, the center of mass is

**Part 6**

Let be the parallelogram whose vertices are , , and . Evaluate .

We use the change of variable formula:

Then,