Math 2415

Paper Homework #11

1. **15.3, Double Integrals in Polar Coordinates:**

   (a) Calculate $\iint_D xy \, dA$ where D is that portioin of the annulus $4 \leq x^2 + y^2 \leq 9$ that is in the first quadrant.

   (b) Find the volume of the solid that is in the first octant and which is bounded by the cylinder $x^2 + y^2 = 9$ and the plane $z = 1 + x + y$.

   (c) Convert the iterated integral $\int_0^2 \int_0^{\sqrt{4-y^2}} (x^2 + y^2) dx \, dy$ to polar coordinates and then evaluate.

2. **15.6, Triple Integrals in Rectangular Coordinates:**

   (a) Sketch the solid, E, bounded by the surfaces $z = x^2 + y^2$, $x = 0$, $y = 0$, $z = 0$, $x + y = 1$. Each pair of the surfaces intersects in a curve. Be sure to include these curves in your sketch. Then calculate $\iiint_E z \, dV$.

   (b) Let E be the solid in the first octant ($x \geq 0$, $y \geq 0$, and $z \geq 0$) that is bounded by the planes $x + z = 2$ and $2y + z = 2$.

      i. Sketch E. *Hint:* The intersection of the two slanted planes is a line. Find two points on that line, one on the z axis and the other in the xy-plane.

      ii. Calculate $\iint_E z^2 \, dV$.