Math 2415

Paper Homework #11

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

   (a) Calculate $\iint_D xy\,dA$ where D is that portion of the annulus $9 \leq x^2 + y^2 \leq 16$ where $y > x$ and $x > 0$.

   (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 $\int_0^3 \int_0^{\sqrt{9-y^2}} \sin(x^2 + y^2)\,dx\,dy$ to polar coordinates and then evaluate.

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

   (a) Sketch the region in the first octant that is bounded by the planes $x + z = 2$ and $2y + z = 2$. How many surfaces form the boundary of E? Each pair of these surfaces intersects in a curve. Be sure to include these curves in your sketch. Find $\iiint_E z\,dV$.

   (b) Find the volume of the region in the first octant bounded by the coordinate planes, the plane $x + z = 2$, and the parabolic cylinder $y = 9 - x^2$.

   (c) Let E be the solid in the first octant bounded by the surfaces $z = 2y$ and $x = 1 - y^2$. (Recall that the first octant is where $x \geq 0$, $y \geq 0$, and $z \geq 0$.) Evaluate $\iiint_E x^2\,dV$.