Math 2415
Problem Section #10

Make sure you do some problems from each section.

15.3, Double Integrals in Polar Coordinates

1. Evaluate $\iint_D e^{x^2+y^2}\,dA$, where D is the region in the 1st quadrant between the circles $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$.
2. Evaluate $\iint_D \cos(x^2+y^2)\,dA$, where D is the region bounded by the semicircle $x = \sqrt{9-y^2}$ and the y-axis.
3. Calculate the volume of the solid under $z = x^2 + y^2$ and above $x^2 + y^2 \leq 16$.
4. Calculate the volume of the solid below the plane $x + 2y + 3z = 6$ and above $x^2 + y^2 \leq 1$.
5. Evaluate the integral by converting to polar coordinates: $\int_0^R \int_{-\sqrt{R^2-x^2}}^{\sqrt{R^2-x^2}} (x+2y)\,dy\,dx$.

15.6, Triple Integrals in Rectangular Coordinates

1. Sketch the region bounded by the following surfaces. Each pair of the surfaces intersects in a curve. Be sure to include these curves in your sketch. Then use a triple integral to calculate the volume of the solid.
   (a) $z = x^2 + y^2$, $x = 0$, $y = 0$, $z = 0$, $x + y = 1$.
   (b) $x = z^2$, $x = 8 - z^2$, $y = 1$, $y = 3$.
   (c) $y = z^2$, $y = z$, $x + y + z = 2$, $x = 0$
2. Evaluate $\iiint_E y\,dV$, where E is the solid bounded by the surfaces $z = 2 - x^2$, $z = x^2 - 2$, $y = 0$ and $y = 1$.
3. Find the volume of the solid enclosed by the cylinder $x = z^2$ and the planes $y = 0$ and $y + z = 2$.