Math 2415

Paper Homework #9

1. **14.8, Constrained Optimization:** Use the method of Lagrange Multipliers to find the absolute maximum and minimum values of the function $f(x, y) = x^2 + y^2 - x - y + 1$ on the unit disc $x^2 + y^2 \leq 1$. To the extent possible solve the problem using a geometric method (a picture) as well as algebraically.

2. **15.1: Double Integrals over Rectangles:** Let V be the volume of the solid bounded by the xz-plane, the yz-plane, the xy-plane, the planes $x = 1$ and $y = 2$ and the surface $z = f(x, y) = (xy)^2 e^{x^3}$.

   (a) Estimate V using a Riemann sum with 4 equal sized rectangles with $\Delta x = 0.5$ and $\Delta y = 1$ and evaluate f at the midpoints of the rectangles.

   (b) Set up an iterated double integral for V.

   (c) Evaluate this integral.

3. **15.2: Double Integrals over General Regions:**

   (a) Find the volume of the solid region that is below the cylinder $z = x^2$ and above the region in the in the xy-plane enclosed by the parabola $y = 2 - x^2$ and the line $y = x$.

   (b) Evaluate $\int_0^2 \int_{y/2}^1 y e^{x^3} \, dx \, dy$.