Calculus Homework Assignment

1. a. Use a Riemann sum with $m = n = 2$ to estimate the value of

$$\iint_R xe^{-xy}\,\mathrm{d}A$$

where $R = [0, 2] \times [0, 1]$. Take the sample points to be upper right corners.

b. Use the Midpoint Rule to estimate the integral in part **a.**

2. Calculate the integral.

$$\textbf{a}.\ \int_0^2 \int_0^{\pi/2} x \sin y \ \mathrm{d}u \ \mathrm{d}x.$$

$$\textbf{b}.\ \int_1^3 \int_1^2 \frac{1}{1 + x + y} \ \mathrm{d}y \ \mathrm{d}x.$$

3. Find the volume of the solid that lies under the hyperbolic paraboloid $z = 3y^2 - x^2 + 2$ and above the rectangle $R = [-1, 1] \times [1, 2]$.

4. Find the average value of

$$f(x, y) = e^y \sqrt{x + e^y}$$

over the rectangle $R = [0, 4] \times [0, 1]$.

5. Evaluate the double integral.

$$\iint_D (x^2 + 2y)\, dA,$$

where D is bounded by $y = x$ and $y = x^3$, $x \geq 0$.

6. Evaluate the integral by reversing the order of integration.

$$\int_0^4 \int_{\sqrt{x}}^2 \frac{1}{y^3 + 1}\, dy\, dx$$

7. a. Use a double integral to find the area of the region, one loop of the rose $r = \cos 3\theta$.

b. Use polar coordinates to find the volume of the solid above the cone

$$z = \sqrt{x^2 + y^2}$$

and below the sphere $x^2 + y^2 + z^2 = 1$.

8. Evaluate the iterated integral by converting to polar coordinates.

$$\int_0^1 \int_y^{\sqrt{2 - y^2}} (x + y)\, dx\, dy$$