Math 13: Written Homework # 1
Due April 2 at 5pm

Please make sure your homework is stapled, if necessary before handing it in. Do not use paper clips or any variation of folding techniques to connect papers.

Solutions be justified in a rigorous way. If you are unsure how much work to show, you can ask me prior to turning in your assignment.

(1) (Problem #4, Chapter 15.1)
  (a) Estimate the volume of the solid that lies below the surface $z = 1+x^2+3y$ and above the rectangle $R = [1, 2] \times [0, 3]$. Use a Riemann sum with $m = n = 2$ and choose the sample points to be the lower left corners. (Even though you can answer this question exactly, that is not what we are looking for. – This problem is to give you an idea of how one can numerically approximate integrals.)
  (b) Repeat the same problem as above, except use the midpoints of rectangles in the Riemann sum as the sample points.

(2) (Problem #24, Chapter 15.2) Sketch the solid whose volume is given by the following iterated integral, and compute the value of the integral:
$$\int_0^1 \int_0^1 (2 - x^2 - y^2)dydx.$$

(3) (Problem #38, Chapter 15.3) Sketch the solid whose volume is given by the following iterated integral, and compute the value of the integral:
$$\int_0^1 \int_0^{1-x^2} (1 - x)dydx.$$

(4) (Problem #54, Chapter 15.3) Evaluate the following integral by interchanging the order of integration:
$$\int_0^8 \int_{\sqrt[3]{y}}^2 e^{x^4} dxdy.$$

(5) (Problem #28, Chapter 15.4)
  (a) A cylindrical drill with radius r_1 is used to bore a hole through the center of a sphere with radius r_2. Find the volume of the ring-shaped solid that remains.
  (b) Express the volume in part (a) in terms of the height h of the ring. Notice that the volume depends on h, not on r_1 or r_2.

(6) (Problem #38, Chapter 15.4) Let D be the disk with center at the origin and radius a. What is the average distance from points in D to the origin?