MATH 13, WINTER 2011
WRITTEN HOMEWORK #4

JOHANNA N.Y. FRANKLIN

This assignment will be due on Wednesday, February 2 at 12:30 p.m. in the boxes outside 105 Kemeny. Look for the column of boxes labeled "Math 13, Winter 2011" and put your assignment in the left ("IN") column corresponding to the first letter of your family name (A-F, G-M, N-S, T-Z).

Remember to show your work. A correct answer with no work shown will receive minimal credit. Your solutions should be detailed enough that any of your classmates could understand them simply by reading them.

(1) (16.5, #20) Consider a square fan blade with sides of length 2 and the lower left corner placed at the origin. If the density of the blade is $\rho(x, y) = 1 + 0.1x$, is it more difficult to rotate the blade about the x-axis or the y-axis?

(2) (16.5, #28)
   (a) Verify that
   $$f(x,y) = \begin{cases} 4xy & \text{if } 0 \le x \le 1 \text{ and } 0 \le y \le 1 \\ 0 & \text{otherwise} \end{cases}$$
   is a joint density function.
   (b) If X and Y are random variables whose joint density function is the function f in part (a), find $P(X \ge \frac{1}{2})$ and $P(X \ge \frac{1}{2}, Y \le \frac{1}{2})$.

(3) (16.7, #20) Use cylindrical coordinates to evaluate $\iiint_E x \, dV$, where E is the region enclosed by the planes $z = 0$ and $z = x + y + 5$ and by the cylinders $x^2 + y^2 = 4$ and $x^2 + y^2 = 9$.

(4) (16.8, #28) Find the average distance from a point in a ball of radius a to its center.