1. Prepquiz 3 B

Problem 1: Compute the average

$$\frac{1}{A(R)}\int_R (x^2 - y^2)dA$$

where the region R is given by the circle of radius r centered at the point (a, b) and $A(R)$ denotes its area.

Problem 2: Compute the integral

$$\int_R x\sqrt{x^2 + y^2}dA$$

where R is the piece of the unit disk in the first quadrant of the xy plane. Work this problem twice, once in cartesian coordinates and then again in polar coordinates.

Problem 3: (Taken from Grossman) Among all the ellipses

$$\left(\frac{x}{a}\right)^2 + \left(\frac{y}{b}\right)^2 = 1$$

passing through the point $(3, 5)$ find the one that has smallest area.