Math 18 Practice Second Midterm

1. Suppose that the function $f(x, y) = x^2 + 2x + y^2 + 1$ gives the temperature at the point (x, y). Let B be the disk of radius 2 centered at the origin, i.e., $B = \{(x, y) \mid x^2 + y^2 \leq 4\}$. Find the maximum and minimum values of f restricted to the disk B.

2. A city occupies a semicircular region of radius 5 km, with the straight part (the diameter of the semicircle) bordering on the ocean. Find the average distance from points in the city to the ocean.

3. State whether each of the following is true or false. If it's false, explain why or give an example showing that it's false.

(a) If $f(x, y) = k$ for all points (x, y) in a region R, then $\iint_R f\, dA = k \cdot \text{Area}(R)$.

(b) Let $\rho(x, y)$ be the population density of a city, in people per km^2. If R is a region in the city, then $\iint_R f\, dA$ gives the average number of people per km^2.

(c) Let $f(x, y, z)$ be a continuous function. If W_1 and W_2 are solid regions with volume(W_1) > volume(W_2), then $\iiint_{W_1} f\, dV > \iiint_{W_2} f\, dV$.

4. Work the following problems from Colley:

(a) 4.4 (p. 293) #4 (Set up, don't solve, and don't use Ex. 3.)

(b) 4.5 (p. 294) #1, 3, 15

(c) 5.7 (p. 371) #1, 3a, 5, 9, 25