Math 53 Discussion Problems Oct 17

1. Find the absolute maxima and minima of the following functions on the given domain.

    (a) $f(x, y) = x^2 - xy + y^2 + 1$ on the closed triangular plate in the first quadrant bounded by the lines $x = 0, y = 4, y = x$

    (b) $f(x, y) = 48 - 32x^3 - 24y^2$ on the rectangular plate $0 \leq x \leq 1, 0 \leq y \leq 1$

    (c) $f(x, y) = x^2 + 2y^2 - x$ on the circular plate $x^2 + y^2 \leq 1$

2. Find the points on the curve $xy^2 = 54$ nearest the origin.

3. Find the dimensions of the closed right circular cylindrical can of smallest surface area whose volume is $16\pi \text{cm}^3$.

4. Find the maximum and minimum values of $f(x, y, z) = x - 2y + 5z$ on the sphere $x^2 + y^2 + z^2 = 30$.

5. Find the volume of the largest closed rectangular box in the first octant having three faces in the coordinate planes and a vertex on the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$, where $a, b, c > 0$.