## MATH 11: MULTIVARIABLE CALCULUS WEEK 6 REVIEW

**Problem 1**. A continuous function f(x, y) defined on the region  $0 \le x < 1$  and  $|y| \le x$  attains a maximum and minimum value on this region.

**Problem 2.** Consider the following contour plot of a function f(x, y). Give upper and lower bounds on  $\int_0^2 \int_0^2 f(x, y) \, dx \, dy$ .



**Problem 3**. Consider the integral

$$\int_{-r}^{r} \int_{-\sqrt{r^2 - x^2}}^{\sqrt{r^2 - x^2}} \int_{0}^{10} f(x, y, z) \, \mathrm{d}z \, \mathrm{d}y \, \mathrm{d}x.$$

Describe the region of integration in one word.

**Problem 4**. What are the Cartesian coordinates of the point with cylindrical coordinates  $(r, \theta, z) = (4, \pi, 6)$ ?

**Problem 5.** What are the spherical coordinates of the point with Cartesian coordinates  $(x, y, z) = (0, -\sqrt{3}, 1)$ ?

**Problem 6.** Plot the function  $r = \cos 3\theta$  and find the area enclosed by it.

**Problem 7.** Evaluate  $\iiint_E (x + y + z) \, dV$  where E is the region in the first octant under  $4 - x^2 - y^2$ .

**Problem 8**. What is the average value of  $(x^2 + y^2 + z^2)^2$  on the ball of radius R centered at the origin?

Date: Thursday, October 20.