## MATH 11: MULTIVARIABLE CALCULUS WEEK 6 REVIEW

Problem 1. A continuous function $f(x, y)$ defined on the region $0 \leq x<1$ and $|y| \leq x$ 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 $\int_{0}^{2} \int_{0}^{2} f(x, y) \mathrm{d} x \mathrm{~d} y$.


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 $\iiint_{E}(x+y+z) \mathrm{d} V$ where $E$ is the region in the first octant under $4-x^{2}-y^{2}$.
Problem 8. What is the average value of $\left(x^{2}+y^{2}+z^{2}\right)^{2}$ on the ball of radius $R$ centered at the origin?

