Discussion for midterm 2 Worksheet
Some past exam problems
Date: 11/3/2021

MATH 53 Multivariable Calculus

1. Find the maximum and minimum values of the function $(x+1)^2+y^2$ on the ellipse $x^2+y^2/4 = 1$, and say at what points these values occur.

2. Find the area of the region enclosed by the curve $x^2+xy+y^2 = 1$. (Hint: use the substitution $x = u + v\sqrt{3}$, $y = u - v\sqrt{3}$.)

3. Compute $\int_C \vec{F} \cdot d\vec{r}$, where C is the unit circle oriented counterclockwise, and $\vec{F}$ is the vector field
$$\vec{F} = (-y^3 + \sin(\sin x), x^3 + \sin(\sin y)).$$

4. Compute
$$\int_{-2}^{2} \int_{y^2}^{4} y \sin(x^2) dx dy$$

5. Calculate the volume of the region consisting of all points that are inside the sphere $x^2+y^2+z^2 = 4$, below the cone $z = \sqrt{x^2+y^2}$, and above the cone $z = -\sqrt{x^2+y^2}$.