Exam 4 Review Problems

1. Compute $\iint_{\mathcal{R}} \frac{\ln(x)}{xy}\, dA$ over the rectangle $\mathcal{R} = [1, e] \times [1, 4]$.

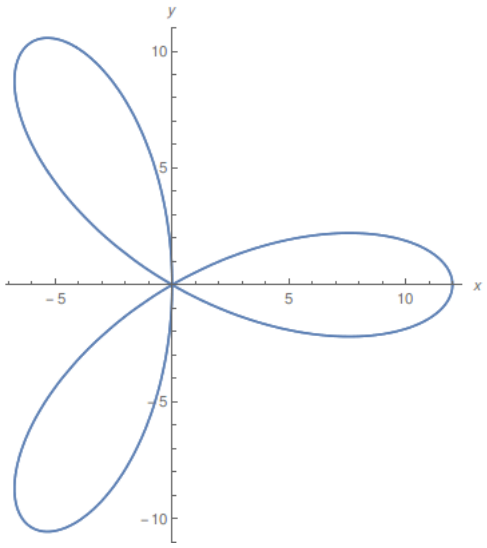
2. Compute $\iint_{\mathcal{R}} \frac{y}{x^2y^2 + 1}\, dA$ over the rectangle $\mathcal{R} = [0, 1] \times [0, 1]$.

3. Reverse the order of integration in the integral $\int_0^{\sqrt{3}} \int_0^{\arctan(y)} f(x, y)\, dxdy$.

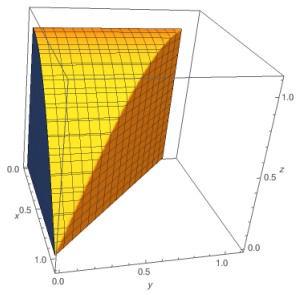
4. Compute $\int_0^2 \int_0^{4-x^2} \frac{xe^{2y}}{4 - y}\, dydx$. (HINT: You may want to reverse the order of integration first!)

5. Compute $\int_{-1}^{1} \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \frac{2}{(1 + x^2 + y^2)^2}\, dydx$.

6. Find the area enclosed by one petal of the 3-petal rose $r = 12\cos(3\theta)$.

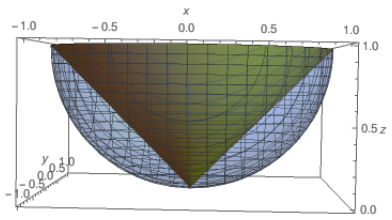


7. Find the volume of the region in the first octant bounded by the plane $y = 1-x$ and the surface $z = \cos(\pi x/2)$ for $0 \le x \le 1$.



8. Find the volume of the region inside the cylinder $x^2 + y^2 = 4$ above the plane $z = 0$ and below the plane $x + z = 3$.

9. Find the volume of the solid bounded below by the sphere $\rho = 2\cos(\phi)$ and above by the cone $z = \sqrt{x^2 + y^2}$.



10. Use the transformation $u = x + 2y,\ v = x - y$ to evaluate the integral

$$\int_0^{2/3} \int_y^{2-2y} (x + 2y)e^{y-x} dx dy.$$