

Homework 8

Due date: October 26.

1. Let $f(x, y) = (e^x y, e^{-x} y)$. Find the center of mass for the image $f([0, 1]^2)$.
2. Let $f(x, y) = (3x + y^2, 4x - 3y^2)$. Find the center of mass for the image $f([0, 1]^2)$.
3. Describe the circle with radius $1/2$ and center $(1/2, 0)$ with polar coordinates.
4. Let $P(x, y) = -y$ and $Q(x, y) = x$. Calculate

$$\int_{\partial D} P dx + Q dy$$

in two ways for the Archimedian spiral $D = \{(r \cos \theta, r \sin(\theta)) : 0 \leq \theta \leq 2\pi, r \leq a\theta\}$.

5. Let $R = [0, 1]^2$ and $P(x, y) = -y^2$ and $Q(x, y) = x^2$. Calculate

$$\int_{\partial R} P dx + Q dy .$$

6. Evaluate

$$\int_0^1 \int_{y^{5/2}}^1 y^{3/2} \cos(1 + x^2) dx dy .$$