

Worksheet 4 - Polar Coordinates

1. Compute the integral:

$$\int_0^1 \int_0^{\sqrt{1-y^2}} \cos(x^2 + y^2) dx dy.$$

2. Find the area of an arbitrary circular sector, described in polar coordinates by:

$$R_1 \leq r \leq R_2; \theta_1 \leq \theta \leq \theta_2.$$

3. Compute the integral:

$$\int_0^{\ln(5)} \int_0^{\sqrt{(\ln(5))^2 - y^2}} e^{\sqrt{x^2 + y^2}} dx dy.$$

4. Find the area of the region enclosed by the curves:

$$r = \cos \theta \text{ and } r = \sin \theta.$$

5. Compute the integral:

$$\int_{\pi/4}^{\pi/2} \int_0^{\frac{2}{\sin \theta + 2 \cos \theta}} r^3 \cos^2 \theta dr d\theta.$$