

Change of Variables Day 3

Melanie Dennis

Dartmouth College
Math13

April 23, 2018

Change of Variables Practice Problems

- 1 Find the area of the region bounded by the x axis, the y axis, and the curve $\sqrt{x} + \sqrt{y} = 1$.
- 2 Evaluate $\iint_{\mathcal{D}} e^{x+y} dA$ where \mathcal{D} is the region given $|x| + |y| \leq 1$. (Hint: try to find a linear transformation in which \mathcal{D}^* is a square).
- 3 Use the Jacobian to prove that the conversion factor for spherical coordinates is $\rho^2 \sin(\phi)$.

Challenge Problems

- 1 Use the change of variables $x = u^2 - v^2$, $y = 2uv$ to evaluate $\iint_{\mathcal{D}} y dA$ where \mathcal{D} is the region above the x axis and bounded by the parabolas $y^2 = 4 - 4x$ and $y^2 = 4 + 4x$.