

1. Evaluate the integral

$$\int_{x=1}^2 \int_{y=0}^x \frac{1}{(x^2 + y^2)^{3/2}} dy dx$$

by converting to polar coordinates.

2. Integrate $f(x, y) = x^2 - y^2$, over the square with vertices $(1, 0)$, $(0, 1)$, $(-1, 0)$, $(0, -1)$. Use the coordinate change $u = x + y$, $v = x - y$.
3. Find the area of a parallelogram with sides $y - x = 0$, $y - x = 2$, $3x - y = 0$, $3x - y = 4$.
4. Find the area of the region defined by $x^{2/3} + y^{2/3} = 1$ in the first quadrant.
5. (14.9.12) Integrate $f(x, y) = \frac{1}{(x^2 + y^2)^2}$, over the region in the first quadrant bounded by the circles $x^2 + y^2 = 2x$, $x^2 + y^2 = 6x$, and $x^2 + y^2 = 2y$, $x^2 + y^2 = 8y$. Use
6. Integrate $f(x, y) = x$ over a circle of radius 1 centered at $(3, 0)$.
7. Find the center of mass of a right half-disk of radius a centered at $(0, 0)$, using the coordinate system of your choice.