

1. (7 points) R is the trapezoidal region with vertices at $(1, 0)$, $(2, 0)$, $(0, -2)$, and $(0, -1)$. Change variables to find $I = \iint_R e^{\frac{x+y}{x-y}} dx dy$.

2. (6 points) Find the mass of the piece of the cylinder $x^2 + y^2 = 4$ that lies above the plane $z = 0$ and below the plane $z = 2 + x$ if the density is $\delta(x, y, z) = z(x^2 + y^2)$ grams per square centimeter.

3. (6 points) Find $I = \iint_S z \, dS$ if S is the part of the paraboloid $z = x^2 + y^2$ that lies underneath the plane $z = 1$.

4. (6 points) Find the flux of $\vec{F}(x, y, z) = \langle -z, 3y, x \rangle$ through the sphere $x^2 + y^2 + z^2 = 4$ if it is oriented outward.