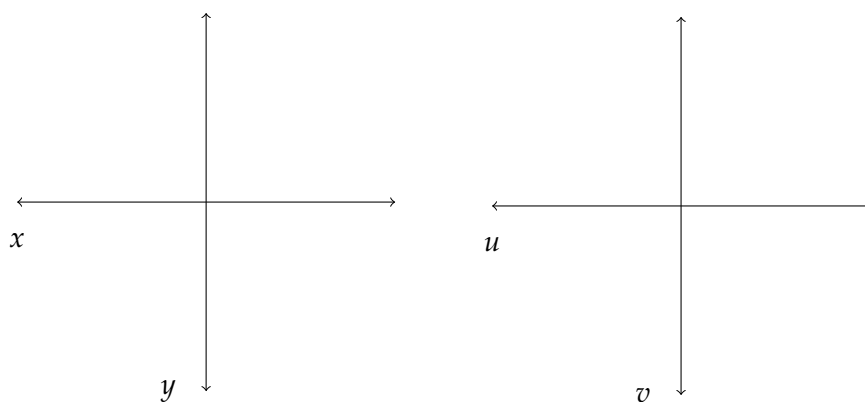1. Let R be the region in the xy plan bounded by the lines $y = x + 1$, $y = x - 1$, $y = -x + 1$, $y = -x - 1$, and let u, v be defined by $x = u - v$, $y = u + v$.

   a) Sketch the region R in both the xy plane and the uv plane:

   b) Find the Jacobian of the transformation $(x, y) \mapsto (u, v)$.

   c) Let $f(x, y) = (x + y)^2$. Rewrite the integral

   $$\int \int_R f(x, y) \, dx \, dy$$

   in terms of u and v, and solve the integral.