

Problem statement Just as with ordinary integrals, double integrals are called *improper* if the integrand is unbounded (i.e., goes to $\pm\infty$) in the integration region or if the integration region is unbounded. We will say that such an integral *converges* if it converges as an iterated integral. (This definition is not quite right in general, but it is fine for nonnegative functions, and these are all we will consider.)

For each integral below, explain why it is improper, determine whether or not it converges, and evaluate it if it does converge. In each case, R is the square described by $0 \leq x \leq 1$ and $0 \leq y \leq 1$.

$$\text{a) } \int \int_R \frac{1}{xy} dA \quad \text{b) } \int \int_R \frac{1}{x+y} dA \quad \text{c) } \int \int_R \frac{1}{(x+y)^2} dA$$