

An **improper integral** is a definite integral

$$\int_a^b f(x)dx$$

where either

- ① one, or both limits is ∞ or $-\infty$, or
- ② the function $f(x)$ is ∞ or $-\infty$ in some region of the domain

Case 1: One of the limits is $\pm\infty$ If $a = -\infty$, calculate $\int_a^b f(x)dx$ as normal (your answer will be a function of a), then take $\lim_{a \rightarrow -\infty}$. If $b = \infty$, calculate $\int_a^b f(x)dx$ as normal (your answer will be a function of b), then take $\lim_{b \rightarrow \infty}$.

Case 2: The function is $\pm\infty$ at some point c Break up the integral $\int_a^b f(x)dx = \int_a^d f(x)dx + \int_d^b f(x)dx$. Then take the limit of the first integral as $d \rightarrow c$ from the left, and of the second integral as $d \rightarrow c$ from the right.