Condition

Consider the following integral:

Function is 1/9x
Lower limit= 0
Upper limit= 1

Determine whether the improper integral diverges or converges.
Evaluate the integral. (If the integral diverges, enter INFINITY. Round to two decimal places if the integral converges.)

Solution

$$\int_0^1 \frac{1}{9x}\,dx = \frac{1}{9}\int_0^1 \frac{1}{x}\,dx = \frac{1}{9}\cdot(\log(1) - \log(0)) = \frac{1}{9}\cdot(0-(-\infty)) = \frac{1}{9}\cdot\infty = \infty$$

At the first step we take out the $\frac{1}{9}$ from the integral sign, because it is a constant. At the second step we take the integral of the function and decompose by the Newton-Leibniz formula, where we get a difference of logarithms. At the third step we do the arithmetic operations ($\log(1) = 0$, $\log(0)$= - ∞). After all the arithmetic operations, we get ∞ and so we can say that the integral diverges.

Answer: the integral diverges.