1 Integrals

1.1 Improper Integral Summary

Integral	$p \leq 1$	$p > 1$	Value
$\displaystyle\int_0^1 \frac{1}{x^p}$	divergent	convergent	$\displaystyle\frac{1}{1-p}$
$\displaystyle\int_1^\infty \frac{1}{x^p}$	divergent	convergent	$\displaystyle\frac{1}{p-1}$

1.2 Comparison Theorem

If f and g are continuous and $f(x) \geq g(x) \geq 0$ for $x \geq a$ (there is some a where f is now always larger than g) then,

If $\int_a^\infty f(x)dx$ is convergent then the "smaller" integral $\int_a^\infty g(x)dx$ must be convergent too.

If $\int_a^\infty g(x)dx$ is divergent then the "larger" integral $\int_a^\infty f(x)dx$ must be divergent too.