THREE IMPORTANT PRINCIPLES

I. THE $\frac{1}{x^p}$ RULE:

$$\int_1^\infty \frac{1}{x^p}\,dx \text{ is } \begin{cases} \text{CONVERGENT WHEN } p > 1 \\ \text{DIVERGENT WHEN } p \le 1 \end{cases}$$

II. THE INTEGRAL TEST FOR $\sum_{n=1}^\infty a_n$:

Suppose f is a (1) continuous, (2) positive, (3) $a_n = f(n)$, (4) $f(x)$ is decreasing on $[1, \infty)$.

THEN,

(i) If $\int_1^\infty f(x)\,dx$ is convergent, so is $\sum_{n=1}^\infty a_n$.

(ii) If $\int_1^\infty f(x)\,dx$ is divergent, so is $\sum_{n=1}^\infty a_n$.

III. THE p-series Test:

The <u>p-series</u> $\sum_{n=1}^\infty \frac{1}{n^p}$ is $\begin{cases} \text{CONVERGENT IF } p > 1 \\ \text{DIVERGENT IF } p \le 1 \end{cases}$