Source: ⟦KBhMATH401SubIndex⟧

1 | Series Convergence

1.1 | Geometric Series

In $\sum_{k=0}^{\infty} a(r^k)$, where $|r| < 1$, the series converges to $\sum_{k=0}^{\infty} a(r^k) = \frac{a}{1-r}$

In $\sum_{k=0}^{n} a(r^k)$, $\sum_{k=0}^{n} a(r^k) = \frac{a - ar^{n+1}}{1-r}$

1.2 | nth term divergence test

If $\lim_{n \to \infty} a_n$ is not zero, the series **will** diverge. The inverse is not necessarily true; that is, if this fails, use another test to test convergence.

1.3 | Intergral Test

If the intergral to infinity is convergent, the sequence is convergent as long as the sequence is continuous, positive, and decreasing. The inverse applies, too.

1.4 | Power Series

$\sum_{n=1}^{\infty} \frac{1}{n^p}$

If a p-series has a p > 1, the p-series will converge

If a p-series has a p <= 1, the p-series will diverge

1.5 | Comparison Test

Pasted image 20210308082352.png

Pasted image 20210308082201.png

Also, if $\lim_{n \to \infty} \frac{a_n}{b_n} = C \ (0 < c < \infty)$, the two series will either both converge or both diverge. So you only need to test one.

Both provided that $a_n, b_n \geq 0$ & $a_n \leq b_n$

1.6 | Alternating Series Test

Pasted image 20210309081249.png

1.7 | Ratio Test

In a geometric series, the common ratio is simply $r = \frac{r^{n+1}}{r^n}$.

As limit goes to infinity in the r

If r is an real value, $|r| < 1$, then series converges. If $|r| \geq 1$, the series diverges.