Admission no: 17919

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Maths Assignment

12. Test the convergence of the series.

$$\frac{1}{1.2.3} - \frac{1}{2.3.4} + \frac{1}{3.4.5} - \ldots$$

$$\Sigma(-1)^{n+1} u_n = \Sigma(-1)^{n+1} \frac{1}{n(n+1)(n+2)}$$

$$u_n = \frac{1}{n(n+1)(n+2)}$$

$$u_{n+1} = \frac{1}{(n+1)(n+2)(n+3)}$$

To prove: $u_n > u_{n+1}$

$$u_n - u_{n+1} > 0$$

$$= \frac{1}{n(n+1)(n+2)} - \frac{1}{(n+1)(n+2)(n+3)}$$

$$= \frac{n+3-n}{n(n+1)(n+2)(n+3)}$$

$$= \frac{3}{n(n+1)(n+2)(n+3)} > 0$$

So $u_n - u_{n+1} > 0$.

So, u_n is a monotonic decreasing sequence.

$$\lim_{n\to\infty} u_n = \lim_{n\to\infty} \frac{1}{n(n+1)(n+2)}$$

$$= \frac{1}{\infty(\infty+1)(\infty+2)} = \frac{1}{\infty}$$

$$\lim_{n\to\infty} u_n = 0$$

$\therefore$ The given series is convergent.