

STEP II, 1998, Q3

- 3 Show that the sum S_N of the first N terms of the series

$$\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \cdots + \frac{2n-1}{n(n+1)(n+2)} + \cdots$$

is

$$\frac{1}{2} \left(\frac{3}{2} + \frac{1}{N+1} - \frac{5}{N+2} \right).$$

What is the limit of S_N as $N \rightarrow \infty$?

The numbers a_n are such that

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

Find an expression for a_n/a_1 and hence, or otherwise, evaluate $\sum_{n=1}^{\infty} a_n$ when $a_1 = \frac{2}{9}$.



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