

STEP III, 1999, Q3

- 3 Justify, by means of a sketch, the formula

$$\lim_{n \rightarrow \infty} \left\{ \frac{1}{n} \sum_{m=1}^n f(1 + m/n) \right\} = \int_1^2 f(x) dx.$$

Show that

$$\lim_{n \rightarrow \infty} \left\{ \frac{1}{n+1} + \frac{1}{n+2} + \cdots + \frac{1}{n+n} \right\} = \ln 2.$$

Evaluate

$$\lim_{n \rightarrow \infty} \left\{ \frac{n}{n^2+1} + \frac{n}{n^2+4} + \cdots + \frac{n}{n^2+n^2} \right\}.$$



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