

Proposed solution of problem U663

Let $(x_n)_{n \geq 2}$ be the sequence defined by

$$x_n = n^2 \left(\frac{\cos \frac{1}{n} - 1}{\cos \frac{1}{n^2} - 1} - n^2 + \frac{1}{12} \right)$$

Evaluate $\lim_{n \rightarrow \infty} n^2 \left(x_n - \frac{31}{360} \right)$