



STEP II, 2006, Q1

1 The sequence of real numbers u_1, u_2, u_3, \dots is defined by

$$u_1 = 2, \quad \text{and} \quad u_{n+1} = k - \frac{36}{u_n} \quad \text{for } n \geq 1, \quad (*)$$

where k is a constant.

- (i) Determine the values of k for which the sequence $(*)$ is:
- (a) constant;
 - (b) periodic with period 2;
 - (c) periodic with period 4.
- (ii) In the case $k = 37$, show that $u_n \geq 2$ for all n . Given that in this case the sequence $(*)$ converges to a limit ℓ , find the value of ℓ .



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