

STEP II, 2003, Q8

8 It is given that y satisfies

$$\frac{dy}{dt} + k \left(\frac{t^2 - 3t + 2}{t + 1} \right) y = 0,$$

where k is a constant, and $y = A$ when $t = 0$, where A is a positive constant. Find y in terms of t , k and A .

Show that y has two stationary values whose ratio is $(3/2)^{6k} e^{-5k/2}$.

Describe the behaviour of y as $t \rightarrow +\infty$ for the case where $k > 0$ and for the case where $k < 0$.

In separate diagrams, sketch the graph of y for $t > 0$ for each of these cases.



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