

STEP II, 2000, Q8

- 8 (i) Let y be the solution of the differential equation

$$\frac{dy}{dx} + 4x e^{-x^2} (y + 3)^{\frac{1}{2}} = 0 \quad (x \geq 0),$$

that satisfies the condition $y = 6$ when $x = 0$. Find y in terms of x and show that $y \rightarrow 1$ as $x \rightarrow \infty$.

- (ii) Let y be any solution of the differential equation

$$\frac{dy}{dx} - x e^{6x^2} (y + 3)^{1-k} = 0 \quad (x \geq 0).$$

Find a value of k such that, as $x \rightarrow \infty$, $e^{-3x^2} y$ tends to a finite non-zero limit, which you should determine.



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