

STEP II, 2008, Q3

- 3 (i) Find the coordinates of the turning points of the curve $y = 27x^3 - 27x^2 + 4$. Sketch the curve and deduce that $x^2(1 - x) \leq 4/27$ for all $x \geq 0$.
- Given that each of the numbers a , b and c lies between 0 and 1, prove by contradiction that at least one of the numbers $bc(1 - a)$, $ca(1 - b)$ and $ab(1 - c)$ is less than or equal to $4/27$.
- (ii) Given that each of the numbers p and q lies between 0 and 1, prove that at least one of the numbers $p(1 - q)$ and $q(1 - p)$ is less than or equal to $1/4$.



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