inkMaths

QUESTION WORKBOOK

Tangents, turning points and curve behaviour

Differentiation · Year 12–13

8 questions · 35 marks

PRINT EDITION

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SECTION A · Warm-up

A1 Find an equation of the tangent to the curve $y = x^2$ at the point $(2, 4)$. [3]

A2 Find an equation of the normal to the curve $y = x^2$ at the point $(2, 4)$. [3]

SECTION B · Standard

B1 Find the coordinates of the stationary points of the curve $y = x^3 - 3x^2 - 9x + 5$, and determine the nature of each. [6]

B2 The curve C has equation $y = x^3 - 3x^2 - 9x + 5$. Find the interval on which C is decreasing. [3]

B3 Show that the curve $y = x^3$ has a stationary point at the origin which is neither a maximum nor a minimum. [3]

B4 A rectangle has perimeter 40 cm. Use calculus to find the dimensions that give the greatest area, and state that area. [5]

SECTION C · Stretch

C1 A closed cylinder has volume 1000 cm^3. Show that its total surface area S cm^2 satisfies $S = 2\pi r^2 + 2000/r$, where r cm is the radius. Hence find the radius that minimises S, giving your answer to 3 significant figures, and justify that your value gives a minimum. [7]

C2 The curve C has equation $y = x + 4/x$ for $x > 0$. Find the minimum value of y, and justify that your value is a minimum. [5]

