



QUESTION WORKBOOK

Tangents, turning points and curve behaviour

Differentiation · Year 12–13

8 questions · 35 marks

NAVY SCREEN EDITION

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 $S \text{ cm}^2$ satisfies $S = 2\pi r^2 + 2000/r$, where $r \text{ cm}$ 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]