



QUESTION WORKBOOK

The product, quotient and chain rules

Differentiation · Year 12–13

9 questions · 30 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 Differentiate $y = (2x + 1)^4$. [2]

A2 Differentiate $y = e^{x^2}$. [2]

SECTION B · Standard

B1 Differentiate $y = (x^2 - 3)^6$, and find the coordinates of the stationary points of the curve. [5]

B2 Differentiate $y = x^3e^{2x}$. [3]

B3 Differentiate $y = x \sin x$, and find the gradient of the curve at $x = \pi$. [3]

B4 Differentiate $y = (2x + 1)/(x^2 + 1)$, and find the gradient of the curve at $x = 0$. [4]

B5 Differentiate $y = \sin^3 x$. [2]

SECTION C · Stretch

- C1** Given that $y = x^2 \ln 3x$ for $x > 0$, show that $dy/dx = x(2 \ln 3x + 1)$, and find the exact coordinates of the stationary point of the curve. [6]

- C2** By writing $\tan x$ as $\sin x / \cos x$, use the quotient rule to show that the derivative of $\tan x$ is $\sec^2 x$. [3]