



QUESTION WORKBOOK

Differentiating trig, exponentials and logs

Differentiation · Year 12–13

9 questions · 29 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 Differentiate $y = \sin 2x$, and $y = \cos 3x$. [2]

A2 Differentiate $y = e^{5x}$, and $y = \ln x$. [2]

SECTION B · Standard

B1 Differentiate $y = 2 \sin 3x + 4 \cos 2x$. [3]

B2 Differentiate $y = 5 \ln x + \sin 2x$, and hence find the gradient of the curve at $x = \pi$, giving your answer to 3 significant figures. [4]

- B3** Prove from first principles that the derivative of $\sin x$ is $\cos x$. You may use the results $(\cos h - 1)/h \rightarrow 0$ and $(\sin h)/h \rightarrow 1$ as $h \rightarrow 0$. [4]

- B4** Differentiate $y = e^{2x} - 4e^{-x}$, and find the gradient of the curve at $x = 0$. [3]

- B5** Differentiate $y = \tan 3x$, and find the gradient of the curve at $x = 0$. [3]

SECTION C · Stretch

- C1** Given that $y = \ln x$, use the fact that $x = e^y$ to show that $dy/dx = 1/x$. [3]

- C2** Show that the derivative of a^x , for a constant $a > 0$, is $a^x \ln a$. Hence find the gradient of the curve $y = 2^x$ at $x = 3$, giving your answer to 3 significant figures. [5]