



---

QUESTION WORKBOOK

# Differentiating trig, exponentials and logs

Differentiation · Year 12–13

9 questions · 29 marks

PRINT 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]