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QUESTION WORKBOOK

# Taylor series

Further Pure 1 · Year FM

7 questions · 30 marks

NAVY SCREEN EDITION

**SECTION A** · Warm-up

**A1** Write down the Taylor series of a function  $f$  about  $x = a$ , as far as the term in  $(x - a)^2$ . [2]

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**A2** Find the Taylor series of  $e^x$  about  $x = 1$ , up to the term in  $(x - 1)^2$ . [3]

**SECTION B** · Standard

**B1** Expand  $\ln x$  in ascending powers of  $(x - 1)$ , up to the term in  $(x - 1)^3$ , and use it to estimate  $\ln 1.1$ . [5]

- B2** Find the Taylor series of  $\tan x$  about  $x = \pi/4$  up to the term in  $(x - \pi/4)^2$ , and estimate  $\tan(\pi/4 + 0.1)$  to 2 decimal places. [5]

- B3** Explain why a Taylor series anchored at  $x = a$  is generally more accurate near  $a$  than a Maclaurin series would be, when  $a$  is far from the origin. [3]

- B4** Expand  $\sqrt{x}$  about  $x = 9$  up to the term in  $(x - 9)^2$ , and use it to estimate  $\sqrt{9.6}$  to 3 decimal places. [5]

## SECTION C · Stretch

- C1**  $y$  satisfies  $dy/dx = x + y^2$  with  $y = 1$  at  $x = 1$ . Find the Taylor series solution for  $y$  in ascending powers of  $(x - 1)$ , up to and including the term in  $(x - 1)^3$ . [7]