



QUESTION WORKBOOK

Series solutions of differential equations

Further Pure 1 · Year FM

6 questions · 20 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

- A1** Describe the Taylor series method for solving a differential equation with given initial conditions. [2]

- A2** For $dy/dx = x + y^2$ with $y = 1$ at $x = 0$, find the values of the first and second derivatives of y at $x = 0$. [3]

SECTION B · Standard

- B1** Continuing the previous question, find the third derivative at $x = 0$ and write the series solution up to the term in x^3 . [4]

B2 Use the substitution $z = y^2$ to solve $2y(dy/dx) + y^2 = x$. [4]

B3 For a second order equation, explain why two initial conditions are needed before the Taylor series method can begin. [3]

SECTION C · Stretch

C1 For the equation $y'' + xy' + 2y = 0$ with $y = 1$ and $y' = 0$ at $x = 0$, find the series solution up to the term in x^4 . [4]