InkMaths

QUESTION WORKBOOK

Solving differential equations

Integration · Year 12-13

6 questions · 20 marks

NAVY SCREEN EDITION

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SECTION A · Warm-up

A1 Separate the variables in $dy/dx = x^2/y$, writing the result as two integrals. [2]

A2 Solve $dy/dx = 3x^2y$ for y > 0, given that $y = 2$ when $x = 0$. [3]

SECTION B · Standard

B1 Solve $dy/dx = y^2$, given that $y = 1$ when $x = 0$, and state where the solution stops being valid. [4]

B2 Solve $dy/dx = x/y$ for y > 0, given that $y = 2$ when $x = 0$. [4]

B3 Water leaks from a tank at a rate proportional to the volume present: $dV/dt = -kV$. Initially the tank holds 500 litres, and after 10 minutes it holds 250. Find V as a function of t, and the value of k to 3 significant figures. [4]

SECTION C · Stretch

C1 A draining tank's depth h obeys $dh/dt = -k\sqrt{h}$ with $h = 16$ at $t = 0$. Solve the equation, and find when the tank empties in terms of k. [3]