InkMaths

QUESTION WORKBOOK

Reduction formulae

Further Pure 2 · Year FM

6 questions · 21 marks

PRINT EDITION

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SECTION A · Warm-up

A1 $I_n = \int \sin^n x \, dx$ between 0 and $\pi/2$. Show that $nI_n = (n - 1)I_{n-2}$. [3]

A2 For the same I_n, given $I_0 = \pi/2$ and $I_1 = 1$, find I_4 and I_5. [3]

SECTION B · Standard

B1 $I_n = \int x^n e^x \, dx$ between 0 and 1. Show that $I_n = e - nI_{n-1}$, and hence find I_3. [4]

B2 $I_n = \int \tan^n x \, dx$ between 0 and $\pi/4$. Show that $I_n = 1/(n - 1) - I_{n-2}$ for $n \geq 2$, and find I_4. [4]

B3 Explain why a reduction formula on its own is not an answer, and how you choose the starting value. [3]

SECTION C · Stretch

C1 $I_n = \int x^n e^{-x} \, dx$ from 0 to infinity. Show that $I_n = nI_{n-1}$, and hence evaluate I_5. [4]