



QUESTION WORKBOOK

Leibnitz's theorem and the Weierstrass substitution

Further Pure 1 · Year FM

6 questions · 20 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 State Leibnitz's theorem for the n th derivative of a product fg . [2]

A2 Under the substitution $t = \tan(x/2)$, write down $\sin x$, $\cos x$ and dx in terms of t . [3]

SECTION B · Standard

B1 Use Leibnitz's theorem to find the fourth derivative of $y = x^3e^x$. [4]

B2 Use $t = \tan(x/2)$ to evaluate $\int 1/(1 + \cos x) \, dx$ from 0 to $\pi/2$, exactly. [4]

B3 Use $t = \tan(x/2)$ to show that $\int \sec x \, dx = \ln|(1+t)/(1-t)| + c$. [4]

SECTION C · Stretch

C1 Explain why Leibnitz's theorem is especially efficient when one factor of the product is a polynomial. [3]