

perfectpapers

[MATH(AH)U3 - EX 2007-2008]

NATIONAL
QUALIFICATIONS
2008

TIME: 1 HOUR

MATHEMATICS
ADVANCED
HIGHER
Unit 3

Estimate Examination Paper

Read Carefully

1. Calculators may be used in this paper.
2. Candidates should answer all questions.
3. Full credit will be given only where the solution contains appropriate working.

This test paper must be withdrawn from candidates after the examination and any follow-up discussion of marks/grades awarded. This is to ensure the 'sight unseen' status of this paper is maintained for your centre and other schools/colleges during the diet of prelim examinations in 2007/2008. Submission of this test paper for Appeals purposes will assume that these conditions have been applied.

Page one

1. Let matrix $A = \begin{pmatrix} 4 & 3 \\ 5 & 6 \end{pmatrix}$.
- (a) Show that $A^2 = 10A - 9I$ where I is the 2×2 identity matrix. 2
- (b) Prove that
- (ii) $A^{-1} = \frac{1}{9}(10I - A)$ 2
2. (a) (i) Obtain the first 4 terms in the expansion of $\ln(1+3x)$. 2
- (ii) Obtain the first 4 terms in the expansion of $\ln(1-3x)$ 2
- (b) Hence, find the terms up to x^4 in the Maclaurin series for $\ln(1-9x^2)$. 4
3. Find the particular solution of $\frac{dy}{dx} + \frac{3y}{x^2} = e^{3x}$ given that, when $x = 3, y = 5e$. 5
4. A recurrence relation is given by the formula $x_{n+1} = \frac{3}{4} \left(x_n + \frac{5}{x_n} \right)$ 3
- Find the fixed points of this recurrence relation.
5. Use the Euclidean Algorithm to find integers x and y such that
- $$485x + 308y = 7$$
- 4

6. (a) Show that the lines

$$L_1: \frac{x+4}{3} = \frac{y+7}{5} = \frac{z+12}{8} \text{ and } L_2: \frac{x+3}{1} = \frac{y}{-1} = \frac{z+10}{3}$$

intersect and find the coordinates of the point of intersection.

5

- (b) Find the equation of the plane π_1 containing the lines L_1 and L_2 .

3

- (c) Calculate the acute angle between the planes π_1 and the plane π_2 with equation $2x + y + 5z = 3$.

2

7. (a) Express $\frac{2}{r^2 + 6r + 8}$ in partial fractions.

2

- (b) Hence evaluate $\sum_{r=1}^n \frac{2}{r^2 + 6r + 8}$, expressing your answer as a single fraction.

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8. Obtain the general solution of the differential equation

$$\frac{d^2y}{dx^2} - 7\frac{dy}{dx} + 10y = 23\sin x + 11\cos x$$

Hence find the particular solution for which $y = 0$ and $\frac{dy}{dx} = -18$ when $x = 0$.

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TOTAL **50**