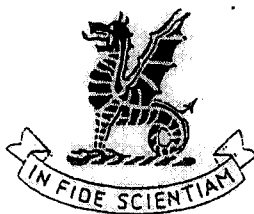


# NEWINGTON COLLEGE



Trial Higher School Certificate Examination 1999

## 12 MATHEMATICS 3 UNIT ADDITIONAL

Time allowed : *Two Hours*

*(plus 5 minutes reading time)*

### DIRECTIONS TO CANDIDATES :

All questions are of equal value.

All questions may be attempted.

In every question, show all necessary working.

Marks may not be awarded for careless or badly arranged work.

Approved silent calculators may be used.

A table of standard integrals is provided for your convenience.

The answers to the seven questions in this paper are to be returned in separate bundles clearly marked Question 1, Question 2 etc.

Each bundle must show the candidate's computer number.

The questions are not necessarily arranged in order of difficulty. Candidates are advised to read the whole paper carefully at the start of the examination.

Unless otherwise stated candidates should leave their answers in simplest exact form.

## Question 1 (12 Marks)

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a) Solve for  $x$ :  $\frac{x+4}{x-2} \geq 3$ .

b) Sketch the function  $y = \frac{1}{2} \sin^{-1} \left( \frac{x}{2} \right)$ .

c) Find the acute angle between the lines whose equations are:

$$y = 2\sqrt{3}x - \sqrt{6}$$

$$7y = \sqrt{3}x + \sqrt{2}$$

d)

(i) Find the equation of the tangent to the curve  $y = -(x-2)^3$  at the point  $P(1,1)$  and find the coordinates of the point  $A$  where the tangent cuts the  $y$ -axis.

(ii) If  $P$  divides the interval  $AB$  internally in the ratio  $1:3$ , find the coordinates of  $B$ .

(iii) Show that  $B$  also lies on the curve.

Question 2 (12 Marks) *Start a new page*

a)

(i) Express  $\sin^2 x$  in terms of  $\cos 2x$ .

(ii) Hence find the volume of the solid of revolution formed when  $y = \sin x$  is rotated about

the  $x$ -axis between the ordinates  $x = \frac{\pi}{4}$  and  $x = \frac{\pi}{2}$ .

b)

(i) Express  $5\cos x - 12\sin x$  in the form  $A\cos(x+\alpha)$ , where  $A > 0$  and  $0 \leq \alpha < 2\pi$ .

(ii) Find the maximum value of  $5\cos x - 12\sin x$  and state the least positive value of  $x$  for which this maximum value occurs.

c) A kite, 50 metres high, is being carried horizontally by the wind at a rate of  $4 \text{ ms}^{-1}$ . How fast is the string being let out, when the length of the string is 100 metres?

d) Calculate the coefficient of  $x^8$  in the expansion of  $\left(2x^3 - \frac{1}{x}\right)^{12}$ .