

Question 1 below, on the *Preparatory Unit*, forms the first part of Tutor-marked Assignment MST204 01. The remainder of the TMA (Part 2, on *Units 1, 2* and *3*) can be found immediately following Question 1 in this booklet. Question 1 is marked out of 25. (The whole TMA is marked out of 100.)

Please send your answers to Question 1 to your tutor, along with an assignment form (PT3). You will find instructions on how to fill in the PT3 form in the *Student Handbook*: be sure to fill in the Assignment Number on this form as

MST204 01.

Your tutor will mark and comment on your solution to Question 1, and will send your script back to you directly to give you some early feedback on the course. He or she will retain your PT3 to enter your marks for the rest of this assignment on it. The form will then be sent to you via Walton Hall, so that your mark can be recorded.

Question 1 (*Preparatory Unit*)

- (a) Make the variable y the subject of the equation

$$\log_e(y+3) - \log_e(y+5) = x + \log_e \frac{3}{5}. \quad [6]$$

- (b) By using implicit differentiation, or otherwise, find the slope of the tangent to the curve

$$x^2 + y^3 = 5$$

at the point $(2, 1)$. Hence find the equation of the tangent to the curve at this point. [6]

- (c) (i) Write

$$\frac{A}{(x+1)^2} + \frac{B}{x+1},$$

where A and B are constants, in the form

$$\frac{\text{expression}}{(x+1)^2}. \quad [2]$$

- (ii) Find values of A and B such that

$$\frac{x}{(x+1)^2} = \frac{A}{(x+1)^2} + \frac{B}{(x+1)}. \quad [2]$$

- (iii) Hence evaluate

$$\int \frac{x}{(x+1)^2} dx \quad (x > -1). \quad [2]$$

- (d) Evaluate the following integrals.

(i) $\int \frac{t^2}{1+t^3} dt \quad (t > -1) \quad [3]$

(ii) $\int_0^3 \frac{z}{(z+1)^{3/2}} dz \quad [4]$
