



## Maths-it Podcast A2-03

A2 Core Revision

### *e and ln*

## Topics

The graphs of  $y = e^x$  and  $y = \ln x$  and their transformations

Solving equations involving  $e^x$  and  $\ln x$

Integrating and differentiating functions involving  $e^x$  and differentiating  $\ln x$

## Questions

1. (a) Solve the equation  $3e^x = 7$ , giving your answer in the form  $\ln a - \ln b$ , where  $a$  and  $b$  are integers. (2)

- (b) By substituting  $y = e^x$ , show that the equation  $3e^{-x} + 4e^x = 8$  can be written as,

$$4y^2 - 8y + 3 = 0$$

- (c) Hence solve the equation  $3e^{-x} + 4e^x = 8$ , giving your answers as exact values of  $x$ . (2)

(Total 7 marks)

2. (a) Sketch the graph of  $y = e^{x+1} - 6$ , labelling the coordinates of the points where the graph cuts the axes. (3)

- (b) (i) Find  $y$  when  $x = -1$ . (1)

(ii) Find  $\frac{dy}{dx}$ . (2)

- (iii) Hence find the equation of the tangent to the curve when  $x = -1$  (3)

- (c) Find  $\int (e^{x+1} - 6) dx$  (2)

(Total 11 marks)

3. (a) Show that the equation  $e^{2x} + 4e^{-2x} = 5$  can be written  $e^{4x} - 5e^{2x} + 4 = 0$ . (2)

- (b) By substituting  $y = e^{2x}$  or otherwise, solve the equation  $e^{2x} + 4e^{-2x} = 5$ . (4)

(Total 6 marks)

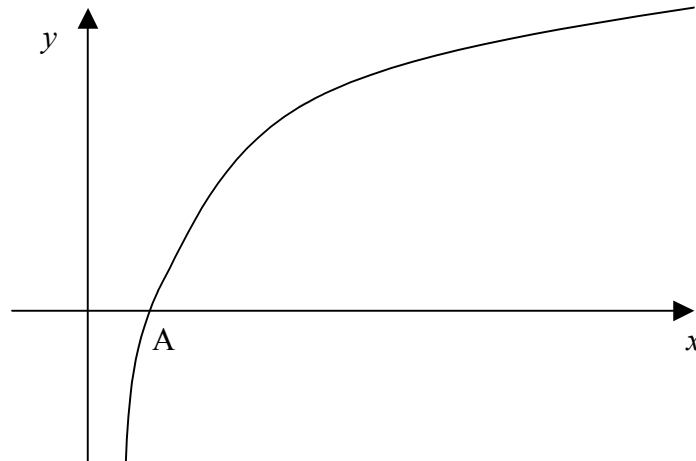


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4. The curve below has equation  $y = \ln \frac{x}{2} + 5$ .



- (a) Find the coordinates of the point A, where the curve cuts the  $x$ -axis. Give your answer exactly. (2)
- (b) (i) Find  $y$  when  $x = 2$ . (1)
- (ii) Find  $\frac{dy}{dx}$ . (2)
- (iii) Hence find the equation of the normal to the curve when  $x = 2$ . (3)
- (c) A second curve has equation  $y = 2 \ln x$  find the coordinates of the point of intersection of the two curves. Give your answers exactly. (4)

**(Total 12 marks)**