

## Chapter 1 to 7 End Test

/50 Marks

1. a. Find the exact solution of the equation  $2e^{6x} - 3e^{3x} - 5 = 0$ .

[3]

- b. Solve the following simultaneous equation

$$e^{4x-7} \div e^{5x+7y} = \frac{1}{e^2}$$

$$xy + 18 = 0$$

[5]

2. Variables  $x$  and  $y$  are such that when  $e^{4y}$  is plotted against  $x$ , a straight line of gradient  $\frac{2}{5}$ , passing through  $(10, 2)$ , is obtained.

a. Find  $y$  in terms of  $x$ .

[3]

b. Find the value of  $y$  when  $x = 45$ , giving your answer in the form  $\ln p$ .

[2]

c. Find the values of  $x$  for which  $y$  can be defined.

[1]

3. Solve the equation  $4|7x - 3| - 5 = 9$ .

[3]

4. **DO NOT USE A CALCULATOR IN THIS QUESTION.**

Variables  $x$  and  $y$  are related by the equation  $y = kx^2$ . When  $x = 1 + \sqrt{2}$ ,  $y = 1 - \sqrt{2}$ . Find the value of  $k$ , giving your answer in the form  $a + b\sqrt{c}$ , where  $a$ ,  $b$  and  $c$  are integers.

[4]

5. The points  $A$ ,  $B$  and  $C$  have coordinates  $(2, 6)$ ,  $(6, 1)$  and  $(p, q)$  respectively. Given that  $B$  is the mid-point of  $AC$ , find the equation of the line that passes through  $C$  and is perpendicular to  $AB$ . Give your answer in the form  $ax+by = c$ , where  $a$ ,  $b$  and  $c$  are integers.

[5]

6. a. Find the range of values of  $x$  satisfying the inequality  $(5x - 1)(6 - x) < 0$ .

[2]

- b. Show that the equation  $(2k + 1)x^2 - 4kx + 2k - 1 = 0$ , where  $k \neq -\frac{1}{2}$ , has distinct, real roots.

[3]

7. (a)(i) Write down the set of values of  $x$  for which  $\lg(5x - 3)$  exists.

[1]

(ii) Solve the equation  $\lg(5x - 3) = 1$ .

[1]

(b) It is given that  $\log_y x = 4 + \frac{1}{2}\log_y 64 + \log_y 162$ , where  $y > 0$ . Find an expression for  $y$  in terms of  $x$ . Simplify your answer.

[5]

8. The polynomial  $p(x) = 6x^3 + ax^2 + 6x + b$ , where  $a$  and  $b$  are integers, is divisible by  $2x - 1$ . When  $p(x)$  is divided by  $x - 2$ , the remainder is 120.  
(a) Find the values of  $a$  and  $b$ .

[4]

- (b) Hence write down the remainder when  $p(x)$  is divided by  $x$ .

[1]

9. Find the possible values of  $k$  for which the equation  $kx^2 + (k + 5)x - 4 = 0$  has real roots.

[5]

10. Solve the equation  $\frac{625^{\frac{x^3-1}{2}}}{125^{x^3}} = 5$ .

[2]