C2 Logs and Indices

1. June 2010 qu.8

(a) Use logarithms to solve the equation $5^{3w-1} = 4^{250}$, giving the value of w correct to 3 s.f [5]

(b) Given that $\log_x(5y + 1) - \log_x 3 = 4$, express y in terms of x. [4]

2. Jan 2010 qu.9

(i) Sketch the curve $y = 6 \times 5^x$, stating the coordinates of any points of intersection with the axes. [3]

(ii) The point P on the curve $y = 9^x$ has y-coordinate equal to 150. Use logarithms to find the x-coordinate of P, correct to 3 significant figures. [3]

(iii) The curves $y = 6 \times 5^x$ and $y = 9^x$ intersect at the point Q. Show that the x-coordinate of Q can be written as $x = \dfrac{1+\log_3 2}{2-\log_3 5}$. [5]

3. June 2009 qu.3

Use logarithms to solve the equation $7^x = 2^{x+1}$, giving the value of x correct to 3 s.f [5]

4. June 2009 qu.9

(i) Sketch the graph of $y = 4k^x$, where k is a constant such that $k > 1$. State the coordinates of any points of intersection with the axes. [2]

(ii) The point P on the curve $y = 4k^x$ has its y-coordinate equal to $20k^2$. Show that the x-coordinate of P may be written as $2 + \log_k 5$. [4]

(iii) (a) Use the trapezium rule, with two strips each of width $\dfrac{1}{2}$, to find an expression for the approximate value of $\int_0^1 4k^x \, dx$. [3]

(b) Given that this approximate value is equal to 16, find the value of k. [3]

5. Jan 2009 qu.8

(a) Given that $\log_a x = p$ and $\log_a y = q$, express the following in terms of p and q.

(i) $\log_a(xy)$ [1] (ii) $\log_a\left(\dfrac{a^2x^3}{y}\right)$ [3]

(b) (i) Express $\log_{10}(x^2 - 10) - \log_{10}x$ as a single logarithm. [1]

(ii) Hence solve the equation $\log_{10}(x^2 - 10) - \log_{10}x = 2\log_{10}3$. [5]

6. June 2008 qu.8

(i) Sketch the curve $y = 2 \times 3^x$, stating the coordinates of any intersections with the axes. [3]

(ii) The curve $y = 2 \times 3^x$ intersects the curve $y = 8^x$ at the point P. Show that the x-coordinate of P may be written as $\dfrac{1}{3-\log_2 3}$. [5]

7. Jan 2008 qu.3

Express each of the following as a single logarithm:

(i) $\log_a 2 + \log_a 3$, **[1]** (ii) $2\log_{10} x - 3\log_{10} y$. **[3]**

8. June 2007 qu.3

Use logarithms to solve the equation $3^{2x+1} = 5^{200}$, giving the value of x correct to 3 significant figures. [5]

8. June 2007 qu.9

The polynomial f(x) is given by f(x) = $x^3 + 6x^2 + x - 4$.

(i) (a) Show that $(x + 1)$ is a factor of f(x). [1]

(b) Hence find the exact roots of the equation f(x) = 0. [6]

(ii) (a) Show that the equation $2\log_2(x + 3) + \log_2 x - \log_2(4x + 2) = 1$

can be written in the form f (x) = 0. [5]

(b) Explain why the equation $2\log_2(x + 3) + \log_2 x - \log_2(4x + 2) = 1$

has only one real root and state the exact value of this root. [2]

9. Jan 2007 qu.5

(a) (i) Express $\log_3(4x + 7) - \log_3 x$ as a single logarithm. [1]

(ii) Hence solve the equation $\log_3(4x + 7) - \log_3 x = 2$. [3]

(b) Use the trapezium rule, with two strips of width 3, to find an approximate value for

$\int_3^9 \log_{10} x\,dx$ giving your answer correct to 3 significant figures. [4]

10. Jan 2006 qu.7

(i) Express each of the following in terms of $\log_{10} x$ and $\log_{10} y$.

(a) $\log_{10}\left(\frac{x}{y}\right)$ [1] (b) $\log_{10}(10x^2y)$ [3]

(ii) Given that $2\log_{10}\left(\frac{x}{y}\right) = 1 + \log_{10}(10x^2y)$, find the value of y correct to 3 decimal places. [4]

11. June 2005 qu.7

(i) Evaluate $\log_5 15 + \log_5 20 - \log_5 12$. [3]

(ii) Given that $y = 3 \times 10^{2x}$, show that $x = a\log_{10}(by)$, where the values of the constants a and b are to be found. [4]