Old Exam Questions – Old Course
Logarithms

(C2 Winter 2005)

2. Use the substitution $3^x = u$ to solve the equation

$$3^{2x} - 3^{x+2} + 14 = 0,$$

giving your answers correct to three decimal places. [6]

10. *(a)* Show that if $x > 0$,

$$\log_a x^k = k \log_a x. \quad [3]$$

(b) Solve the equation

$$\log_{10}(x^2 + 48) = \log_{10} x + 2\log_{10} 4. \quad [5]$$

(C2 Summer 2005)

6. *(a)* Given that $x > 0$, $y > 0$, show that

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y \;. \quad [3]$$

(b) (i) Solve the equation

$$5^{2x+1} = 7,$$

giving your answer correct to four decimal places.

(ii) Express $\log_{10} 2 + 2\log_{10} 18 - \frac{3}{2}\log_{10} 36$ as a single logarithm in its simplest form. [8]

(C2 Winter 2006)

10. *(a)* Given that $x > 0$, $y > 0$, show that

$$\log_a(xy) = \log_a x + \log_a y. \quad [3]$$

(b) Given that $\int_1^3 \log_{10} x \, dx$ has an approximate value of 0·5628, find an approximate value for $\int_1^3 \log_{10}(10x)\, dx$. Give your answer correct to four decimal places. [4]

(C2 Summer 2006)

8. *(a)* Given that $x > 0$, show that

$$\log_a\left(x^n\right) = n\log_a x.$$ [3]

(b) Solve the equation

$$5^{3x+1} = 6,$$

giving your answer correct to four decimal places. [4]

(C2 Winter 2007)

8. *(a)* Given that $x > 0$, $y > 0$, show that $\log_a(xy) = \log_a x + \log_a y$. [3]

(b) Express $\log_a 36 + \frac{1}{2}\log_a 256 - 2\log_a 48$ as a single logarithm. [4]

(c) Solve the equation

$$2^{x+1} = 5,$$

giving your answer correct to three decimal places. [2]

(C2 Summer 2007)

7. *(a)* (i) Given that $p > 0$, $q > 0$, show that $\log_a pq = \log_a p + \log_a q$.

(ii) Given that

$$\log_a x + \log_a(3x+4) = 2\log_a(3x-4), \text{ where } x > \frac{4}{3},$$

find the value of x. [8]

(b) Solve $3^x = 11$, giving your answer correct to three decimal places. [2]

(C2 Winter 2008)

6. *(a)* Given that $x > 0$, $y > 0$, show that

$$\log_a\frac{x}{y} = \log_a x - \log_a y.$$ [3]

(b) (i) Solve the equation

$$3^{2x-1} = 11,$$

giving your answer correct to three decimal places.

(ii) Express $\frac{3}{2}\log_a 16 + \log_a 6 - 2\log_a 12$ as a single logarithm in its simplest form. [7]

(C2 Summer 2008)

7. (*a*) Given that $x > 0$, show that

$$\log_a x^n = n\log_a x\ . \qquad [3]$$

(*b*) Solve the equation

$$\log_a(3x + 4) - \log_a x = 3\log_a 2\ . \qquad [4]$$

(*c*) Solve the equation

$$4^{3y+2} = 7\ ,$$

giving your answer correct to three decimal places. [3]

(C2 Winter 2009)

7. (*a*) Given that $x > 0$, $y > 0$, show that

$$\log_a xy = \log_a x + \log_a y. \qquad [3]$$

(*b*) Solve the equation

$$\log_9 x = -\frac{1}{2}\ . \qquad [2]$$

(*c*) Solve the equation

$$\log_a(4x + 7) = \log_a x + 2\log_a 3. \qquad [4]$$

(C2 Summer 2009)

7. (*a*) Given that $x > 0$, $y > 0$, show that

$$\log_a \frac{x}{y} = \log_a x - \log_a y. \qquad [3]$$

(*b*) Solve the equation

$$3^{5-2x} = 7.$$

Show your working and give your answer correct to three decimal places. [3]

(*c*) Solve the equation

$$\log_a(x-3) + \log_a(x+3) = 2\log_a(x-2). \qquad [4]$$

(C2 Winter 2010)

7. *(a)* Given that $x > 0$, show that

$$\log_a x^n = n\log_a x.$$ [3]

(b) Express $\frac{1}{2}\log_a 324 + \log_a 56 - 2\log_a 12$ in the form $\log_a b$, where b is a constant whose value is to be found. [4]

(c) (i) Rewrite the equation

$$3^x = 2^{x+1}$$

in the form

$$c^x = d,$$

where the values of the constants c and d are to be found.

(ii) Hence or otherwise, solve the equation

$$3^x = 2^{x+1},$$

giving your answer correct to two decimal places. [4]

(C2 Summer 2010)

8. *(a)* Given that $x > 0$, show that

$$\log_a x^n = n\log_a x.$$ [3]

(b) Solve the equation

$$6^{2y-1} = 4.$$

Show your working and give your answer correct to three decimal places. [3]

(c) Given that $\log_a 4 = \frac{1}{2}$, find the value of a. [2]

(C2 Winter 2011)

7. Find all values of x satisfying the equation

$$\log_a(6x^2 + 11) - \log_a x = 2\log_a 5.$$ [5]

(C2 Summer 2011)

7. *(a)* Given that $x > 0$, $y > 0$, show that

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y.$$ [3]

(b) Express

$$\frac{1}{2}\log_a x^8 - \log_a 4x + 3\log_a \frac{2}{x}$$

as a single logarithm in its simplest form. [4]

(C2 Winter 2012)

7. *(a)* Given that $x > 0, y > 0$, show that

$$\log_a xy = \log_a x + \log_a y.$$ [3]

(b) Solve the equation

$$2^{3-5x} = 12.$$

Show your working and give your answer correct to three decimal places. [3]

(c) (i) Express

$$\log_9(3x - 1) + \log_9(x + 4) - 2\log_9(x + 1)$$

as a single logarithm.

(ii) Hence solve the equation

$$\log_9(3x - 1) + \log_9(x + 4) - 2\log_9(x + 1) = \frac{1}{2}.$$ [5]

(C2 Summer 2012)

7. *(a)* Given that $x > 0$, show that

$$\log_a x^n = n\log_a x.$$ [3]

(b) Solve the equation

$$9^{\frac{x}{2} - 3} = 6.$$

Show your working and give your answer correct to three decimal places. [3]

(c) Solve the equation

$$\log_a(x - 2) + \log_a(4x + 1) = 2\log_a(2x - 3).$$ [4]

(C2 Winter 2013)

7. *(a)* Given that $x > 0, y > 0$, show that

$$\log_a \frac{x}{y} = \log_a x - \log_a y.$$ [3]

(b) Solve the equation

$$6^{2x + 5} = 7.$$

Show your working and give your answer correct to three decimal places. [3]

(C2 Summer 2013)

7. *(a)* Given that $x > 0$, $y > 0$, show that

$$\log_a xy = \log_a x + \log_a y.$$ [3]

(b) Solve the equation

$$5^{2-3x} = 8.$$

Show your working and give your answer correct to three decimal places. [3]

(c) Solve the equation

$$\log_a 90x^2 - \log_a\left(\frac{5}{x}\right) = \frac{1}{2}\log_a 144x^8.$$ [4]

(C2 Winter 2014)

7. *(a)* Given that $x > 0$, show that

$$\log_a x^n = n\log_a x.$$ [3]

(b) Solve the equation

$$7^{5-4x} = 11.$$

Show your working and give your answer correct to three decimal places. [3]

(c) Solve the equation

$$\log_8 x = -\frac{1}{3}.$$ [2]

(C2 Summer 2014)

7. *(a)* Solve the equation

$$3^{\frac{5x}{4}-2} = 7.$$

Show your working and give your answer correct to three decimal places. [3]

(b) The positive numbers a and b are such that

$$\log_a b = 5.$$

(i) Express b as a power of a.

(ii) **Using your answer to part (i)**, evaluate $\log_b a$. [3]

(C2 Summer 2015)

7. *(a)* Given that $x > 0$, $y > 0$, show that

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y.$$ [3]

(b) Find all values of x satisfying the equation

$$\log_a(6x^2 + 9x + 2) - \log_a x = 4\log_a 2.$$ [5]

(C2 Summer 2016)

7. *(a)* Given that $x > 0$, show that

$$\log_a x^n = n \log_a x.$$ [3]

(b) Solve the equation

$$4^{3x+1} = 22.$$

Show your working and give your answer correct to two decimal places. [3]

(c) Given that

$$\log_d z = 2\log_d 6 - \log_d 9 - 1,$$

express z in terms of d, giving your answer in a form **not** involving logarithms. [4]

(C2 Summer 2017)

7. *(a)* Given that $x > 0$, $y > 0$, show that

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y.$$ [3]

(b) Express

$$\frac{1}{3}\log_b x^{15} - \log_b 27x + 4\log_b \frac{3}{x}$$

as a single logarithm in its simplest form. [4]

(c) Given that $\log_d 5 = \frac{1}{3}$, find the value of d. [2]

(C2 Summer 2018)

7. *(a)* Given that $x > 0$, $y > 0$, show that

$$\log_a xy = \log_a x + \log_a y.$$ [3]

(b) Find all values of x satisfying the equation

$$\log_a(11x^2 + 16x + 5) - \log_a(4x^2 + 1) = 3\log_a 2.$$ [5]