1. (a) Given that

    $$2\log_3(x-5) - \log_3(2x-13) = 1,$$

    show that $x^2 - 16x + 64 = 0$.

    (5)

    (b) Hence, or otherwise, solve $2\log_3(x-5) - \log_3(2x-13) = 1$.

    (2)
    (Total 7 marks)

2. (a) Find the positive value of x such that

    $$\log x\ 64 = 2$$

    (2)

    (b) Solve for x

    $$\log_2(11 - 6x) = 2\log_2(x-1) + 3$$

    (6)
    (Total 8 marks)

3. Given that $0 < x < 4$ and

    $$\log_5(4-x) - 2\log_5 x = 1,$$

    find the value of x.

    (Total 6 marks)

4.   Given that a and b are positive constants, solve the simultaneous equations

$$a = 3b,$$

$$\log_3 a + \log_3 b = 2.$$

Give your answers as exact numbers.

(Total 6 marks)

5.   (i)   Write down the value of $\log_6 36$.

(1)

(ii)   Express $2 \log_a 3 + \log_a 11$ as a single logarithm to base a.

(3)
(Total 4 marks)

6.   Solve

(a) $5^x = 8$, giving your answers to 3 significant figures,

(3)

(b) $\log_2(x + 1) - \log_2 x = \log_2 7$.

(3)
(Total 6 marks)

7.   Find, giving your answer to 3 significant figures where appropriate, the value of x for which

(a) $3^x = 5$,

(3)

(b) $\log_2 (2x + 1) - \log_2 x = 2$.

(4)
(Total 7 marks)

8. Given that $\log_5 x = a$ and $\log_5 y = b$, find in terms of a and b,

(a) $\log_5 \left(\dfrac{x^2}{y} \right)$,

(2)

(b) $\log_5(25x\sqrt{y})$.

(3)

It is given that $\log_5 \left(\dfrac{x^2}{y} \right) = 1$ and that $\log_5(25x\sqrt{y}) = 1$.

(c)   Form simultaneous equations in a and b.

(1)

(d)   Show that $a = -0.25$ and find the value of b.

(2)

Using the value of a and b, or otherwise,

(e)   calculate, to 3 decimal places, the value of x and the value of y.

(3)
(Total 11 marks)

9. Given that $\log_2 x = a$, find, in terms of a, the simplest form of

(a) $\log_2 (16x)$,

(2)

(b) $\log_2 \left(\dfrac{x^4}{2} \right)$

(3)

(c) Hence, or otherwise, solve

$$\log_2{(16x)} - \log_2\left(\frac{x^4}{2}\right) = \frac{1}{2},$$

giving your answer in its simplest surd form.

(4)
(Total 9 marks)

10. (a) Simplify $\dfrac{x^2 + 4x + 3}{x^2 + x}$.

(2)

(b) Find the value of x for which $\log_2{(x^2 + 4x + 3)} - \log_2{(x^2 + x)} = 4$.

(4)
(Total 6 marks)

11. Solve

$$2\log_3{x} - \log_3{(x - 2)} = 2, \ x > 2.$$

(Total 6 marks)