Laws of Logarithms and Logarithmic Equations Exam Questions Sheet 2

Q1.

Find the values of x such that

$$2\log_3 x - \log_3(x - 2) = 2$$

(5)

(Total 5 marks)

Q2.

Given that $\log_3 x = a$, find in terms of a,

(a) $\log_3 (9x)$

(2)

(b) $\log_3\left(\frac{x^5}{81}\right)$

(3)

giving each answer in its simplest form.

(c) Solve, for x,

$$\log_3(9x) + \log_3\left(\frac{x^5}{81}\right) = 3$$

giving your answer to 4 significant figures.

(4)

(Total 9 marks)

Q3.

(i)

$$2\log(x + a) = \log(16a^6), \text{ where } a \text{ is a positive constant}$$

Find x in terms of a, giving your answer in its simplest form.

(3)

(ii)

$$\log_3(9y + b) - \log_3(2y - b) = 2, \text{ where } b \text{ is a positive constant}$$

Find y in terms of b, giving your answer in its simplest form.

(4)

(Total for question = 7 marks)

Q4.

Given that

$$\log_3(3b + 1) - \log_3(a - 2) = -1, \quad a > 2$$

express b in terms of a.

(3)

Q5.

Find the values of y such that

$$\log_2(11y - 3) - \log_2 3 - 2\log_2 y = 1, \quad y > \frac{3}{11}$$

(6)

(Total for question = 6 marks)

Q6.

Use algebra to find the values of x for which

$$\log_2(x + 15) - 4 = \tfrac{1}{2}\log_2 x$$

(6)

(Total 6 marks)

Q7.

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

(2)

(a) $\log_3(x - 2) = -1$.

(b) Solve the equation

$$2\log_3 x - \log_3 7x = 1.$$

(4)

(Total 4 marks)

Q8.

A student's attempt to solve the equation $2\log_2 x - \log_2 \sqrt{x} = 3$ is shown below.

$2\log_2 x - \log_2 \sqrt{x} = 3$	
$2\log_2 \left(\frac{x}{\sqrt{x}}\right) = 3$	using the subtraction law for logs
$2\log_2 \left(\sqrt{x}\right) = 3$	simplifying
$\log_2 x = 3$	using the power law for logs
$x = 3^2 = 9$	using the definition of a log

(a) Identify two errors made by this student, giving a brief explanation of each.

(2)

(b) Write out the correct solution.

(3)

(Total for question = 5 marks)