3.1 Consolidation Exercise (Non Calculator)

Any solution based entirely on graphical or numerical methods is not acceptable

Marks Available: 70

Question 1

Solve these equations;

$$(i) 5^x = 125$$

(ii)
$$2^x = \frac{1}{8}$$

(iii)
$$9^x = 3$$

$$(iv)$$
 $17^x = 1$

$$(\mathbf{v}) \qquad \left(\sqrt{2}\right)^x = 8$$

(vi)
$$27^x = \frac{1}{9}$$

[6 marks]

Question 2

Determine the value of;

$$(i) 5^{-2}$$

(ii)
$$8^{\frac{2}{3}}$$

(**iii**)
$$13^0$$

(iv)
$$9^{-\frac{3}{2}}$$

$$(\mathbf{v}) \qquad \left(\sqrt{6}\right)^4$$

Solve these equations;

$$(\mathbf{i}) \qquad log_4 \, 64 \, = \, x$$

(ii)
$$log_3\left(\frac{1}{81}\right) = x$$

(iii)
$$log_9 27 = x$$

$$(iv) log_7 7 = x$$

$$(\mathbf{v})$$
 $log_8 1 = x$

$$(vi)$$
 $log_{100} 10 = x$

[6 marks]

Question 4

Solve these equations;

$$(\mathbf{i}) \qquad log_x 8 = 3$$

(ii)
$$log_x 7 = 0.5$$

(iii)
$$log_x\left(\frac{1}{9}\right) = -1$$

$$(iv) log_x 1000 = 3$$

$$(\mathbf{v}) \qquad log_x \, 25 \, = \, \frac{2}{3}$$

(vi)
$$log_x 81 = 4$$

Solve these equations;

$$(\mathbf{i}) \quad log_2 x = 5$$

$$(\mathbf{ii}) \qquad log_5 x = -1$$

(iii)
$$log_8 x = \frac{5}{3}$$

$$(iv) \qquad log_3 x = -3$$

$$(\mathbf{v}) \qquad log_{0.5} x = 4$$

$$(\mathbf{vi}) \qquad \log_{\sqrt{10}} x = -4$$

[6 marks]

Question 6

(i) Use the rules of logs to prove that,

$$3\log_x 8 - 2\log_x 4 = \log_x 32$$

[3 marks]

(ii) Hence, or otherwise, determine the integer value of,

$$3 \log_2 8 - 2 \log_2 4$$

[2 marks]



Use the rules of logs to prove that,

$$2 \log_7 2 + 3 \log_7 5 = \log_7 500$$

[4 marks]

Question 8

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

$$a = 8b$$

$$log_2 a + 2 log_2 b = 4$$

Give your answers as exact numbers.

AS-Level Examination Question from May 2018, Paper 1, Q5 (Edexcel)

A student's attempt to solve the equation $2 \log_2 x - \log_2 \sqrt{x} = 3$ is as follows;

$$2 \log_2 x - \log_2 \sqrt{x} = 3$$

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

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

x = 9

[2 marks]

(**b**) Write out the correct solution.

[3 marks]

Question 10

(i) Write down the value of log_{36} 6

[1 mark]

(ii) Express $3 \log_a 2 + \log_a 13$ as a single logarithm to base a.

[3 marks]

A-Level Examination Question from 2018, Specimen Paper 1, Q5 (Edexcel)

$$f(x) = x^3 + ax^2 - ax + 48$$
, where a is a constant

Given that f(-6) = 0,

(a) (i) show that a = 4

[2 marks]

(ii) express f(x) as a product of two algebraic factors.

[2 marks]

Given that $2 \log_2(x + 2) + \log_2 x - \log_2(x - 6) = 3$

(b) show that $x^3 + 4x^2 - 4x + 48 = 0$

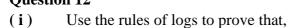
[4 marks]

(c) hence explain why

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

has no real roots.

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$$5 \log_3 x - 2 \log_3 3x + \log_3 72 = 3 \log_3 2x$$

[4 marks]

(ii) Hence, or otherwise, prove that,

$$5 \log_2 x - 2 \log_2 3x + \log_2 72 = 3 (1 + \log_2 x)$$

[2 marks]