MAA HL

Test on Exponents and Logarithms (2)

(without GDC)

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Date: 28 November 2019

Marks: /40

Name of student: _____

1. [Maximum mark: 6]

Let $\log_2 3 = a$ and $\log_2 7 = b$. Express the following in terms of a and b.

(a) $\log_2 63$ [2]

(b) $\log_2 42$ [2]

(c) $\log_7 \sqrt{3}$ [2]

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Turn over

2. [Maximum mark: 6]

Solve the logarithmic equation

$$2\log_3 x + \log_{\frac{1}{3}}(x-2) = 2$$

3. [Maximum mark: 5]

Solve the system of equations

$$\ln(x - 5 + e^2) = 2$$

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

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4. [Maximum mark: 4]

Show that

$$\log_a b \cdot \log_b c \cdot \log_c a = 1$$

5. [Maximum mark: 6]

Solve the equation

$$\log_2(\log_2 x) = \log_4(\log_4 x)$$

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6. [Maximum mark: 6]

(a) Show that $6xy + 2y - 15x - 5 \equiv (3x + 1)(2y - 5)$ [1]

(b) **Hence** solve the equation $6xe^x + 2e^x - 15x = 5$ [5]

7. [Maximum mark: 7]

The cubic function $f(t) = t^3 - 10t^2 + 7t + 18$ is divisible by $(t^2 - t - 2)$.

(a) Find the three real roots of $f(t)$. [4]

(b) Solve the logarithmic equation

$$(\ln x)^3 + 7\ln x + 18 = 10(\ln x)^2$$ [3]