End of non-calculator section – go back and check your working

Mercedes College

YEAR 12 MATHEMATICS METHODS Test 3 2016

Logarithms

NAME: _____ **Date: Wednesday 29 June 2016**

TEACHER: _____

Calculator section:	**15 minutes (max)**	**11 marks**
Non-Calculator section:		**34 marks**
OVERALL:	**45 minutes**	**45 marks**

INSTRUCTIONS:
Show FULL working Answer all questions on this test paper
Questions or parts of questions worth more than two marks require working to be shown to receive full marks.
Allowed: Maths Methods WACE formula sheets, 3 calculators, 1 A4 page of notes

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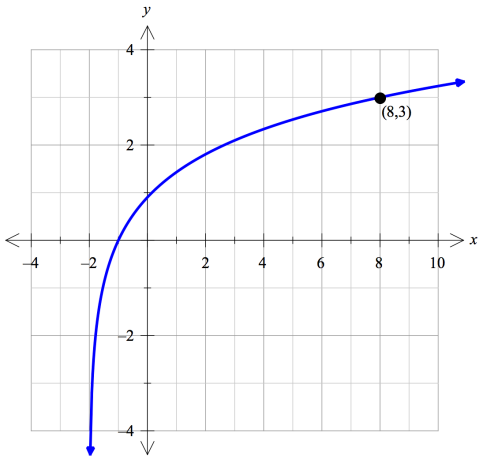
Question 1 [3 + 2 = 5 marks]

a. Accurately plot the graph $y=\log(x-3)$ on the axes below, clearly detailing the coordinates of any axis intercepts and the equations of any asymptotes.

b. The equation for the function shown below is $y=a\times\log(x+b)$
What are the values of a and b ?



Question 2 [2 + 2 + 2 = 6 marks]

The intensity of sound is measured in decibels. As a consequence of the sensitivity of the human ear, this scale is logarithmic, which allows sound intensities across a wide spectrum (from almost inaudible to ear-splittingly loud). Decibels are measured using the equation below:

$$D = 10 \log\left(\frac{I}{I_n}\right)$$

where D = Decibel level (dB)
I = Intensity of sound in watts per square metre (W/m^2)
$I_n = 1 \times 10^{-12}$ W/m^2 (this is the intensity of the least audible sound a human can hear)

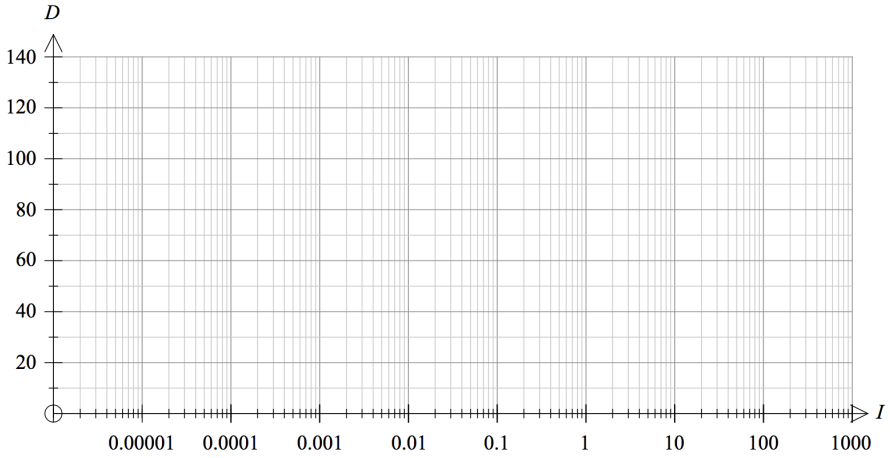
a. Calculate the decibel level for

(i) normal conversation, which has a sound intensity of $I = 1 \times 10^{-6}$ W/m^2.

(ii) the kerb-side of a busy road, with a sound intensity of $I = 1 \times 10^{-4}$ W/m^2.

b. Calculate the sound intensity (I) that corresponds to the pain threshold of 125 dB.

c. Represent the above three points on the logarithmic graph paper, using them to plot the relationship between I and D

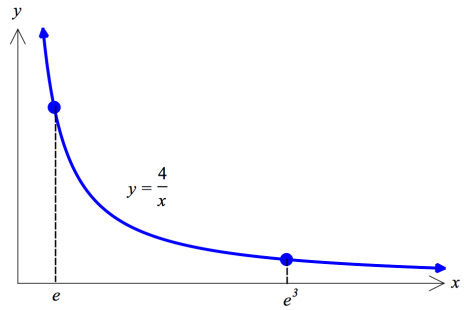


End of calculator section – go back and check your working
Raise your hand when you are ready to go to the non-calculator section

Question 8 [4 + 3 = 7 marks]

a. Calculate the equation of the tangent to the curve $y = \ln x$ at the point $(e^2, 2)$.

b. Evaluate the area contained between the function $y = \frac{4}{x}$ and the x-axis from an x-value of e to an x-value of e^3.



Question 7 [3 + 4 = 7 marks]

a. Calculate $\frac{d}{dx}$ for the following:

(i) $\ln(3-4x)$ (ii) $\ln\left(\sqrt{2x^3+1}\right)$

b. Evaluate the following integrals:

(i) $\int \frac{12x^2}{7-x^3}dx$ (ii) $\int 2\tan(4x+1)dx$

At this stage you may work on both papers (without a calculator or notes)

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Question 3 [2 marks]

a. Write $\log_2 64 = 6$ as an exponential statement:

b. Write $3^x = 7$ as a logarithmic statement:

Question 4 [1 + 1 + 2 + 1 = 5 marks]

Evaluate the following:

a. $\log_2 32$ b. $\log_3 \frac{1}{9}$

c. $5+3\ln e^2$ d. $3^{\log_3 5}$

Question 5 [2 + 2 = 4 marks]
Express each of the following as a single logarithm:

a. $4\log a - 2\log b + \log c^3$

b. $\log_7 xy - 2 + \log_7 10$

Question 6 [2 + 3 + 4 = 9 marks]
Solve using your knowledge of logarithms, giving solutions as exact values in simplest form.

a. $2(5^x) = 12$

b. $3^{x+1} = 4^{2x}$

c. $e^{2x} - 5(e^x) = 14$