End of Test

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Test 4

Logarithmic Functions

Semester One 2018
Year 12 Mathematics Methods
Calculator Assumed

Name:

Date: 29/06/2018 7.45am

You may have a calculator, a single-sided page of notes and a formula sheet for the test.

40 Minutes **Total_____/35 marks**

Teacher:

_____ Mr McClelland
_____ Mrs. Carter
_____ Mr Gannon
_____ Ms Cheng
_____ Mr Staffe
_____ Mr Strain

Questions 1 **(7 marks)**

Find the derivatives of the following. Do not simplify your answer.

(a) $\ln\left(2x^3-3x^2+4x-1\right)^3$ (2 marks)

(b) $e^x \ln\left(x\right)$ (2 marks)

(c) $\ln\left(x\right)\cos\left(x\right)+\dfrac{\sin\left(x\right)}{x}$ (3 marks)

Question 2 **(5 marks)**

(a) Use Polynomial Long division to simplify $\dfrac{x^2-2x+5}{x-3}$. (3 marks)

(b) Hence find $\int \dfrac{x^2-2x+5}{x-3}\,dx$. (2 marks)

(ii) Solve the value for t if $t=3\log_2 10+\log_2\left(\dfrac{2+t}{3}\right)$. (2 marks)

(b) It is found by observation that the model for *Cutus pius* does not quite work. It is known that the model for the population of *Asla bible* is satisfactory. The form of the model for *Cutus pius* is $N_C\left(t\right)=8000+c\times 2^t$. Find the value of c, correct to two decimal places, if it is known that $N_A\left(15\right)=N_C\left(15\right)$. (2 marks)

Question 7 **(8 marks)**

There are two species of insects living in a suburb: the *Asla bibla* and the *Cutus pius*. The number of *Ala bibla* alive at time t days after 1 January 2000 is given by

$$N_A(t)=10\,000+1000t,0\le t\le 15$$

The number of *Cutus pius* alive at time t days after 1 January 2000 is given by

$$N_C(t)=8000+3\times 2^t,0\le t\le 15$$

(a) (i) Show full reasoning that $N_A(t)=N_C(t)$ if and only if $t=3\log_2 10+\log_2\left(\frac{2+t}{3}\right)$.

(4 marks)

Question 3 **(5 marks)**

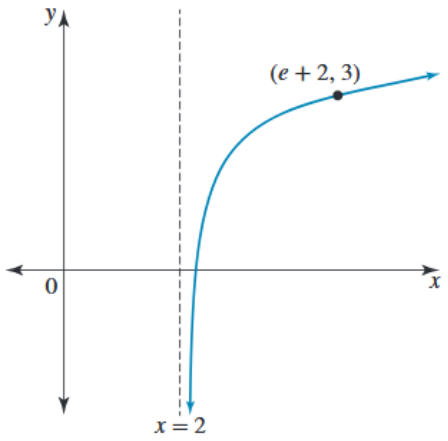
(a) Find the constants a and b given that for $\{x\in R: x\neq 2, x\neq -3\}$. (3 marks)

$$\frac{a}{x-2}+\frac{b}{x+3}=\frac{x+8}{x^2+x-6}$$

(b) Hence find $\int \frac{x+8}{x^2+x-6}\,dx$. (2 marks)

Question 4 **(2 marks)**

The rule for the function shown is $y=\ln(x-m)+n$. Find the values of m and n.



Question 5 **(3 marks)**

Solve the following equations for x. Show full algebraic reasoning.

$$3e^{2x}-5e^{x}-2=0$$

Question 6 **(5 marks)**

The graph of the function with the rule $y=3\log(x+1)+2$ intersects the axes at the point $(a,0)$ and ¿). Find the exact values of a and b. Show full algebraic reasoning.