



FACULTY OF SCIENCES

DEPARTMENT OF PURE AND APPLIED MATHEMATICS

MODULE: MATHEMATICAL ANALYSIS B – MAA00B1

CAMPUS: APK

ASSESSMENT: EXAM – PART B

DATE: 5 DECEMBER 2016

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INTERNAL MODERATOR: DR UA KOUMBA

DURATION: 50 MINUTES FOR PART B **MARKS:** 27

INITIALS AND SURNAME: _____

STUDENT NUMBER: _____

CONTACT NUMBER: _____

NUMBER OF PAGES: 8 (INCLUDING COVER PAGE)

INSTRUCTIONS:

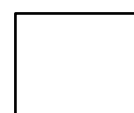
- ANSWER ALL THE QUESTIONS IN PEN
- NO REMARK ON PENCIL, NO TIPEX ALLOWED
- STATE ALL FORMULAS USED, MARKS ARE GIVEN TO FORMULAS
- SHOW ALL THE NECESSARY CALCULATIONS
- IF NECESSARY ROUND OFF TO TWO DECIMAL PLACES
- SCIENTIFIC CALCULATORS ARE ALLOWED
- PROGRAMMABLE CALCULATORS ARE NOT ALLOWED
- QUESTIONS CAN BE ANSWERED IN ANY ORDER

Part B

Question 1**[4]**

Prove the following differentiation rule using first principles:

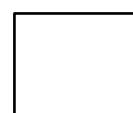
$$\text{If } f(x) = m(x)n(x), \text{ then } f'(x) = n(x)m'(x) + m(x)n'(x).$$



Question 2**[4]**

Differentiate the following function using first principles:

$$f(x) = \sqrt{x-1}$$



Question 3**[6]**

Differentiate the following functions. You do not need to simplify your answer.

3.1 $y = 3^{x^2+6x}$

[3]

3.2 $y = \ln\left(\sqrt{\frac{x^2+1}{x-1}}\right)$

[3]

Question 4**[3]**

Given

$$f(x) = \frac{x}{x^3 - 1}$$

4.1 If possible, determine the vertical asymptote(s) of f . [1]

4.2 If possible, determine the horizontal asymptote(s) of f . [1]

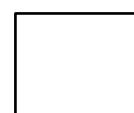
4.3 If possible, determine the oblique asymptote(s) of f . [1]



Question 5**[4]**

For which values of x is the following function concave up:

$$f(x) = 5 - 3x^3 + x^4$$



Question 6**[6]**

Given the function:

$$f(x) = \sqrt[3]{x^2}(2x - 1)$$

6.1 Determine the critical point(s) of $f(x)$.**[3]**

6.2 Determine, by making use of the second derivative test, whether the critical point(s) determined in Question 9.1 are maximum, minimum or a possible point of inflection.

[3]**End of Part B – Total 27 marks**

**Use this page if you want to redo a question.
Clearly indicate at the question that the answer is on Page 8.**

