



FACULTY OF SCIENCE

DEPARTMENT OF PURE AND APPLIED MATHEMATICS

MODULE: INTRODUCTORY MATHEMATICAL ANALYSIS A – MAA00A1 & MAT00A1
CAMPUS: APK
ASSESSMENT: SUPPLEMENTARY EXAM

DATE: JULY 2017
ASSESSORS: MR C HATINGIMANA
MS ML JUGA
MS M NOUKO
MR W VAN REENEN
INTERNAL MODERATOR: MR MSW POTGIETER
DURATION: 2 HOURS

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INITIALS AND SURNAME: _____

STUDENT NUMBER: _____

CONTACT NUMBER: _____

NUMBER OF PAGES: 12 (INCLUDING COVER PAGE)

INSTRUCTIONS:

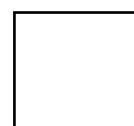
- ANSWER ALL THE QUESTIONS IN PEN.
- ALL GRAPHS MUST BE DRAWN IN PEN.
- NO PENCIL OR TIPEX ALLOWED.
- SHOW ALL THE NECESSARY CALCULATIONS CLEARLY.
- IF FORMULAS ARE USED THEY MUST BE STATED AS MARKS ARE GIVEN TO THEM.
- SCIENTIFIC AND FINANCIAL CALCULATORS ARE ALLOWED.
- IF NECESSARY, ROUND OFF TO TWO DECIMAL PLACES.
- THE QUESTIONS CAN BE ANSWERED IN ANY ORDER.

Question 1**[8]**

Simplify the following expressions completely:

1.1 $\frac{x^4-1}{x^2y-4xy+3y} \div \frac{2x^2+2}{2x^2-3x-9}$ [5]

1.2 $\frac{(x^3)^2}{x^5} \times \left[\frac{(\sqrt{x})^{12}}{x^3} \right]^2$ [3]



Question 2**[2]**

Rationalise the denominator of the following fraction:

$$\frac{1}{2 + \sqrt{y + 4}}$$

Question 3**[5]**

Solve for x in the following equations:

3.1 $\ln(12x^2 - 10x + 9) = \ln(12x^2 + 19)$ [2]

3.2 $\frac{e^{(5-2x)}}{e^{(x+1)}} = e^{10}$ [3]



Question 4**[10]**

Three cards are drawn from a deck of 52 cards without replacement. Find the probability that:

4.1 All three cards are spades. [2]

4.2 The first card is a spade and the two others are diamonds. [2]

4.3 The first card is a diamond, second card is a spade and the last card is a heart. [2]

4.4 All cards are black. [2]

4.5 All cards are not black. [2]



Question 6**[11]**

Given the following system of constraints:

$$-40x + 20y \geq -120$$

$$-2x + y \leq 8$$

$$y \leq -2x + 10$$

$$x, y \geq 0$$

- 6.1 Graph all of the inequalities on the same set of axes, clearly indicating all intercepts and the feasible region. [5]

- 6.2 Determine the corner points of the feasible region. [5]



- 6.3 If possible, determine the value of x and y that will minimize the following function: [1]

$$P = 0.4x - 0.2y.$$

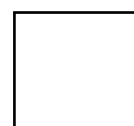
Question 7

[7]

Differentiate each of the following:

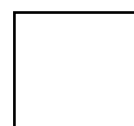
7.1 $f(x) = \ln(5x^2 + 10)$.

[2]



7.2 $f(x) = (\sqrt[3]{39x - 2x^2 + 9})^2$ [2]

7.3 $f(x) = \frac{2x+9}{e^{x-2}}$ [3]



Question 8**[3]**

Given the consumption function of a country:

$$C = 9 + 0.8I^2 - 0.3\sqrt{I}$$

8.1 Find the function describing the marginal propensity to consume. [1]

8.2 Find the marginal propensity to consume if $I = 25$ [1]

8.3 Find the marginal propensity to save if $I = 25$. [1]

Question 9**[10]**

Given the following function:

$$f(x) = 2x^3 - 9x^2 + 12x + 7$$

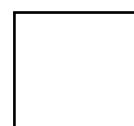
9.1 Determine the Domain of the function. [1]



9.2 Determine the coordinate/s of the turning point/s. [2]

9.3 Determine whether the turning point/s are maximum or minimum. [2]

9.4 Determine the intervals along which the function is increasing and decreasing. [2]



9.5 Determine the coordinate of the point of inflection. [1]

9.6 Determine the intervals of concavity. [2]

Question 10

[6]

*You are **not** allowed to use a financial calculator for this question.*

Today, Charlotte deposits money into an account which earns 5% compounded annually for 7 years. How much did she deposit today that yielded her the same amount in the future, as would R2,000 deposited at the end of each year for 7 years at 6% compounded annually?



Question 11**[9]**

*You are **only** allowed to use a financial calculator for this question.*

- 11.1 Given a nominal rate of 7.63% compounded quarterly, what is the effective rate? [2]

Answer:	
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- 11.2 Find the future value of an investment of R1200 at the beginning of each year for 12 years at the rate of 8% compounded annually. [2]

Answer:	
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- 11.3 An initial investment of R10,000 in a business guarantees the following cash flows:

Year	Cash Flow
1	R2,000
2	R1,500
3	R1,500
4	R8,000

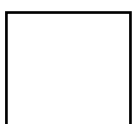
If we assume an interest rate of 6% compounded annually, determine the net present value of the cash flows. [2]

Answer:	
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- 11.4 *South African Airways (SAA)* wants to replace one of their *Boeing 737-400* aircrafts in 5 years' time with a *Boeing 737-800 MAX*. *SAA* estimate that they will be able to sell off their current machine for R 400,000,000 whilst a new machine is estimated at R 1,000,000,000. They want to set up a sinking fund for the new purchase, by using the scrap value of their current machine as deposit on the new machine. *Pinnacle Industrial Bank* offers *SAA* a savings option, where they will make payments at the start of each month and will earn interest at a rate of 10%, compounded monthly. Determine the required monthly payment into this savings option. [3]

Answer:	
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End of Assessment – Total 71 Marks



Use this space if you want to redo a question. Clearly indicate at the question that the answer is on Page 12.

