AFRICA UNIVERSITY
A United Methodist-Related Institution

COLLEGE OF BUSINESS, PEACE, LEADERSHIP AND GOVERNANCE

NMMS105: MATHEMATICS FOR BUSINESS 2

END OF SECOND SEMESTER EXAMINATIONS

MAY/JUNE 2020

LECTURER: TARAMBAWAMWE P

DURATION: 48 Hours

INSTRUCTIONS

You are required to answer ONE question only

Credit will be awarded for logical, systematic and neat presentations

Question 1

a) **[15 marks]**

The value of determinant $\begin{vmatrix} b+c & a+b & a \\ c+a & b+c & b \\ a+b & c+a & c \end{vmatrix}$ is equal to:

(b) **[15 marks]**

The value of x for which the matrix

$$A = \begin{bmatrix} 2 & 0 & 7 \\ 0 & 1 & 0 \\ 1 & -2 & 1 \end{bmatrix} \text{ is inverse of } B = \begin{bmatrix} -x & 14x & 7x \\ 0 & 1 & 0 \\ x & -4x & -2x \end{bmatrix} \text{ is}$$

c.

$$\begin{bmatrix} 1 & -1 & 0 \\ 0 & -m & 1 \\ \frac{a}{1+m} & -1 & 0 \end{bmatrix} \begin{bmatrix} Y \\ C_d \\ M \end{bmatrix} = \begin{bmatrix} I+X \\ 0 \\ 0 \end{bmatrix}$$

give the solution to the system of equations using Cramer's rule ie find Y and M.

[15marks]

d) Solve $\begin{pmatrix} 1 & -2 & 1 \\ 2 & -1 & -3 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$

Using row operations and give your answers in terms of s were s = z

[15 marks]

Question 2

a. Find the general and particular solutions of the following

i. $\mathbf{Y_{t+1}} = 10Y_t$, given $Y_0 = 20$ **[6 marks]**

ii. $\mathbf{P_{t+1}} = 0.75P_t + 9(3)^t$, given $P_0 = 190$ **[10 marks]**

b. The relationship between P_t , the price of a good in season *t*, to its price during the previous season is given by the equation: $P_t = 1.06P_{t-1}$.

i. Outline verbally the relationship defined by the difference equation. **[5 marks]**

ii. Solve the difference equation, given that $P_1 = 4100$. **[5 marks]**

iii. Use the solution you found in (ii) to describe how the price will change in future years. **[6marks]**

c. Given the equation for equilibrium national model $Y_t = C_t + I_t$ where $C_t = 120 + 0.3Y_{t-1}$; $I_t = 5 + 0.2Y_{t-1}$,

i. Write the equilibrium equation as a first order difference equation **[10 marks]**

ii. Solve the difference equation, given $Y_0 = 100$.Is it stable? **[10 marks]**

iii. calculate the number of years it will take for equilibrium income to reach 450 **[10 marks]**

Question 3

a) find dy/dx for each of the following

i. $y = 4e^x(1 + \ln x)$ **[9 marks]**

ii. $y = e^x \ln(5x^3 + x^2)$ **[9 marks]**

iii. $y = \dfrac{(2x+3)^4}{(x+1)^3}$ **[9 marks]**

b)

Given that $f(x) = \dfrac{4}{x} - 3x + 2$,

(i) find $f'(x)$, **[3]**

(ii) find $f''\left(\frac{1}{2}\right)$. **[4]**

C)

Fig. 8 shows part of the curve $y = f(x)$, where

$$f(x) = (e^x - 1)^2 \quad \text{for } x \geqslant 0.$$

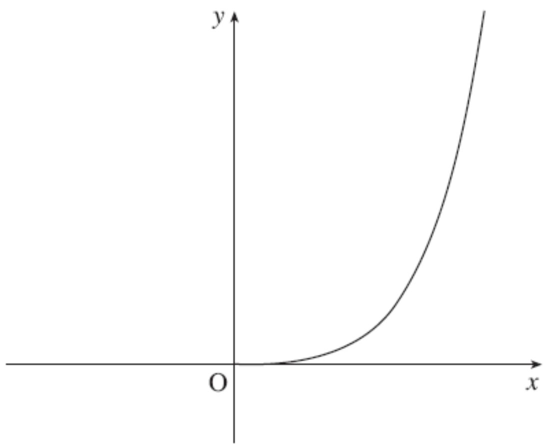

Fig. 8

(i) Find $f'(x)$, and hence calculate the gradient of the curve $y = f(x)$ at the origin and at the point $(\ln 2, 1)$. [5]

d)

The curve C has equation $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = \frac{4x+1}{x-2}, \quad x > 2$$

(a) Show that

$$\mathrm{f}'(x) = \frac{-9}{(x-2)^2}$$

(3)

Given that P is a point on C such that $\mathrm{f}'(x) = -1$,

(b) find the coordinates of P.

(3)

e)

The position of an object at any time t is given by $s(t)=3t^4-40t^3+126t^2-9$.

i. Determine the velocity of the object at any time t. **[5 marks]**

ii. Does the object ever stop changing? **[5 marks]**

iii. When is the object moving to the right and when is the object moving to the left?

[5 marks]

<u>End of Examination Paper</u>