



FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS AND APPLIED MATHEMATICS

MODULE: BASIC MATHEMATICS AND APPLICATIONS IN ECONOMICS
AND BUSINESS B – MAEB322 and MAEB0B1

CAMPUS: APK

ASSESSMENT: SUPPLEMENTARY EXAM

DATE: JANUARY 2020

ASSESSORS: MR W CHUKWU
MS T OBERHOLZER

INTERNAL MODERATOR: MRS M JUGA

DURATION: 2 HOURS

70

INITIALS AND SURNAME: _____

STUDENT NUMBER: _____

CONTACT NUMBER: _____

NUMBER OF PAGES: 13 (INCLUDING COVER PAGE)

INSTRUCTIONS:

- ANSWER ALL THE QUESTIONS IN PEN ON THE TEST SCRIPT
- ALL GRAPHS MUST BE DRAWN IN PEN
- NO PENCIL OR TIPEX ALLOWED
- STATE ALL FORMULAS USED – MARKS ARE AWARDED TO FORMULAS
- SHOW ALL THE NECCESARY CALCULATIONS
- IF NECESSARY, ROUND OFF TO TWO DECIMAL PLACES
- SCIENTIFIC CALCULATORS ARE ALLOWED
- THE QUESTIONS CAN BE ANSWERED IN ANY ORDER

QUESTION 1

[10]

Multiple Choice Options

For questions 1.1 to 1.10, there is ONLY ONE correct answer per question. Choose the correct answer, and make a cross (X) in the correct block.

QUESTION	A	B	C	D	E	Corrections
1	A	B	C	D	E	
2	A	B	C	D	E	
3	A	B	C	D	E	
4	A	B	C	D	E	
5	A	B	C	D	E	
6	A	B	C	D	E	
7	A	B	C	D	E	
8	A	B	C	D	E	
9	A	B	C	D	E	
10	A	B	C	D	E	

1.1 Evaluate the derivative of the function

$$y = \sqrt[4]{\sqrt[3]{\sqrt{x^{12}}}}$$

when $x = 1$.

- A. $\frac{1}{4}$
- B. $\frac{4x^2}{9}$
- C. $\frac{7}{12}$
- D. $\frac{1}{2}$
- E. None of the above

1.2 Differentiate

$$h(z) = \ln\sqrt{4z^2} - \frac{1}{3\pi+4}$$

- A. $-z$
- B. $\frac{4}{z}$
- C. $-\frac{1}{3\pi+4}$
- D. $\frac{1}{z^2}$
- E. None of the above

1.3 In MAEB311 tutorial class there are 12 women and 20 men. What is the probability of choosing a man?

- A. $\frac{8}{5}$
- B. $\frac{3}{8}$
- C. $\frac{5}{8}$
- D. $\frac{5}{3}$
- E None of the above

1.4 The yearly interest payable on a deposit of \$375 at 6.2% p.a. simple interest is:

- A \$23.25
- B \$232.50
- C \$12.50
- D \$125.00
- E None of the above

1.5 An interest rate of 8% compounded quarterly corresponds to an effective rate of

- A 8%.
- B 8.1600%.
- C 8.24%.
- D 9.2456%.
- E None of the above

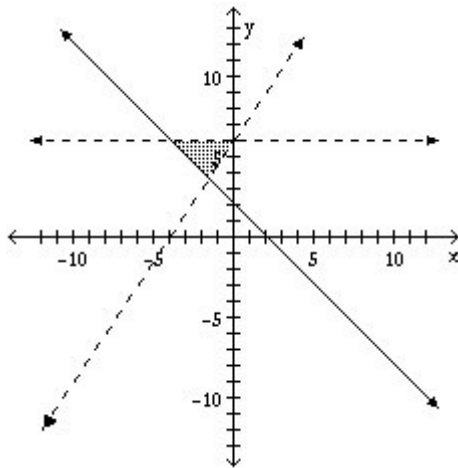
1.6 Suppose a person invests \$20,000 in a business venture that guarantees the same cash flow at the end of every quarter for four years. If the investment earns interest at the rate of 16% compounded quarterly, then each cash flow is

- A \$1716.40
- B \$1527.52.
- C \$916.40.
- D \$1917.39.
- E None of the above

1.7 If an investment of \$1 500 earns interest at an annual rate of 9% compounded continuously, then the value (in dollars) of the investment six years from now is

- A $1\,500(1.09)^6$
- B $1\,500(1.09)^{-6}$
- C $1\,500e^{0.54}$
- D $1\,500e^{-0.54}$
- E None of the above

1.8 The region indicated in the diagram



is described by

A
$$\begin{cases} y < 6 \\ 4x + 4y - y > 0 \\ x - y + 2 \geq 0 \end{cases}$$

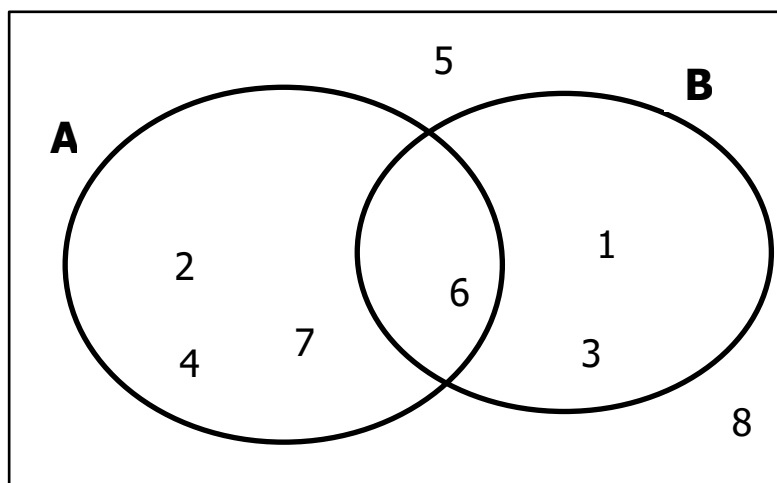
B
$$\begin{cases} x < 6 \\ 3x + 5y - 4 > 0 \\ 4x - 2y + 9 \leq 0 \end{cases}$$

C
$$\begin{cases} y < 6 \\ x + y - 2 \geq 0 \\ 3x - 2y + 12 < 0 \end{cases}$$

D
$$\begin{cases} y < 6 \\ 3x + 2y - 8 \leq 0 \\ 2x - 4y + 5 > 0 \end{cases}$$

- E None of the above

Use the Venn-diagram below to answer questions 1.9 and 1.10.



S

1.9 Determine $P(A \cap B)$

- A. $\frac{6}{7}$
- B. $\frac{8}{7}$
- C. $\frac{4}{3}$
- D. $\frac{1}{6}$
- E. None of the above

1.10 Determine $P(A^c)$

- A. $\frac{3}{7}$
- B. $\frac{1}{3}$
- C. \emptyset
- D. $\frac{3}{7}$
- E. None of the above

QUESTION 2

[12]

- 2.1 Find the present value of \$5000 due in 3 years if the interest rate is $6\frac{3}{4}\%$ compounded monthly. [4]

- 2.2 For an initial investment of \$10,000, suppose a company guarantees the following cash flows at the end of the indicated years:

Year	Cash Flow
1	\$4000
3	\$8000

Assume an interest rate of 5% compounded annually.

- 2.2.1 Determine the net present value of the cash flows. [3]

- 2.2.2 Is the investment profitable? [1]

2.3 A debt of \$2000 due four years from now is to be repaid by a payment of \$1000 now and a second payment at the end of two years. How much the second payment should be if the interest rate is 5% compounded annually? [4]

HINT: *Use a time-line to indicate the information*

QUESTION 3

[4]

A man bought a stereo system for \$3500 on credit and agreed to pay off the loan by making monthly payments of \$79. If the store charges an interest rate of 11% compounded monthly, how many months will it take to pay off the debt?

[6]

Show your important calculations and use the table provided to set up the Amortization schedule. Supply headings for the columns.

[illegible]

QUESTION 5

[8]

Given the following set of constraints:

$$\begin{cases} x + 3y \leq 15 \\ 4x + 3y \leq 24 \\ x \geq 0, y \geq 0 \end{cases}$$

5.1 Graphically show the feasible region

[4]

5.2 Write down the corner points of the feasible region

[2]

5.3 Maximize: $Z = 10x + 15y$

[2]

QUESTION 6

[11]

Consider the following sample space S with events A, B and C :

$$S = \{1, 2, 3, 4, 5, 6, 7\} \quad A = \{1, 2, 3, 5\} \quad B = \{4, 5, 6\} \quad C = \{1, 3, 5\}$$

6.1. Use the above events and construct a Venn-Diagram which represents the events. [4]

6.2. Determine the following:

a) $P(A)$ [1]

b) $P(B)$ [1]

c) $P(A \cap B)$ [1]

d) $P(A) \cdot P(B)$ [1]

e) $P(A) \cdot P(C)$ [1]

f) Are A and B independent events? [1]

[7]

8	12	0	10	8	1	14	12	14	16
4	7	11	9	12	7	15	10	21	22
19	6								

- [3]

[illegible]

7.2 Draw a bar graph for this distribution in **Question 7.1**

[5]

QUESTION 8

[5]

A bag contains 5 black balls and 3 white balls. Maggie picks a ball at random from the bag and does not replace it back in the bag. She mixes the bag and then picks another ball at random from the bag.

8.1 Construct a probability tree of the problem.

[3]

8.2 What is the probability that Maggie picks a black ball on her second draw?

[2]

QUESTION 9

[6]

The total number of units produced per day by m employees of a manufacturer is given by

$$q = \frac{100m - m^2}{10}.$$

If $p = 50 - \frac{q}{10}$ is the price per unit at which the q units are sold. Find the marginal-revenue product for $m=10$.

End of Assessment – 70 Total Marks

Use this space to redo a question. Clearly indicate at the question that the solution is on page 13.