UNIVERSITY
OF
JOHANNESBURG

FACULTY OF SCIENCES

DEPARTMENT OF MATHEMATICS

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

CAMPUS: APK

ASSESSMENT: EXAM

DATE: 1 NOVEMBER 2014

ASSESSORS: MR W VAN REENEN
MR U KUMBA

INTERNAL MODERATOR: MR RJ MAARTENS

DURATION: 2 HOURS

78

INITIALS AND SURNAME: _____

STUDENT NUMBER: _____

CONTACT NUMBER: _____

NUMBER OF PAGES: 12

INSTRUCTIONS:

ANSWER ALL THE QUESTIONS IN PEN
ALL GRAPHS MUST BE DRAWN IN PEN
NO PENCIL ALLOWED
NO TIPEX ALLOWED
STATE ALL FORMULAS USED, MARKS ARE GIVEN TO
FORMULAS
SHOW ALL THE NECCESARY CALCULATIONS
IF NECESSARY ROUND OFF TO TWO DECIMAL PLACES
CALCULATORS ARE ALLOWED

QUESTION 1 [6]

An initial investment of $R28\,000$ in a business guarantees the following cash flows:

Year	Cash Flow
2	$R\,10\,000$
4	$R\,12\,000$
6	$R\,14\,000$

Assume an interest rate of 5.5% compounded monthly.

1.1   Find the net present value of the cash flows.   (5)

1.2   Is the investment profitable?   (1)

QUESTION 3 [9]

Given the following system of constraints

$$y \leq 7$$

$$3x - y \leq 3$$

$$x + y \geq 5$$

$$x, y \geq 0$$

3.1   Graph the system of constraints and indicate the feasible region

3.2   Maximise $Z = 4x - 6y$ subject to the aforementioned constraints.

QUESTION 4 [5]

State and prove the Profit Maximisation Theorem.

QUESTION 5 [10]

Determine the slope of the tangent line to each of the following equations, at the point $x = 1$:

5.1 $f(x) = \sqrt{3x - 1} - 3e^{2x}$ (5)

5.2 $f(x) = \dfrac{3x^2}{1 + \ln(2x)}$ (5)

QUESTION 6 [4]

Given $TR = \frac{14}{13}Q^3 - 9Q$

Determine

6.1　　AR　　　　　　　　　　　　　　　　　　　　　　　　(2)

6.2　　MR　　　　　　　　　　　　　　　　　　　　　　　　(2)

QUESTION 7 [4]

Given　　　　　$AR = 17 - 13Q^2$

Determine

7.1　　TR　　　　　　　　　　　　　　　　　　　　　　　　(2)

7.2　　MR　　　　　　　　　　　　　　　　　　　　　　　　(2)

QUESTION 8 [12]

For the function $TC = 3Q^2 - 0.1Q^3$

Determine

8.1   Stationary point/s.   (4)

8.2   Use the second derivative test to label each stationary point as a maximum, minimum or point of inflection.   (6)

9.2   Determine the curvature along the interval $x > 0$.   (2)

QUESTION 10 [18]

Given two demand functions of two different markets, $P_1 = 15 - Q_1$ & $P_2 = 18 - 2Q_2$, where both markets share the common total cost function $TC = 2Q + 10$.

If price discrimination is allowed, calculate the maximum profit.

QUESTION 11 [6]

Let

$$P(E) = \frac{1}{5} \qquad\qquad P(EUF) = \frac{41}{105} \qquad\qquad P(E \cap F) = \frac{1}{7}$$

Determine

11.1 $P(F)$ (2)

11.2 $P(E' \cup F)$ (4)

QUESTION 12 [4]

In a certain population, 10% of the people are rich, 5% are famous and 3% are rich and famous. For a person picked randomly from this population

12.1   What is the chance that the person is not rich?   (2)

12.2   What is the chance that the person is rich but not famous?   (2)

End of Assessment – Total Marks: 78

Use this page if you want to redo a question. Please indicate clearly at the question that the answer is here.