

Test

Math. for Bus. II

Math 104

Math. Department

**University of Bahrain
College of Science
Department of Mathematics
Summer 2009/2010
FINAL EXAM**

**Math 104
Mathematics for Business II**

**Date: 23rd Aug 2010
Time: 120 Minutes**

Instructions to Candidates

1. Check that this exam has 6 questions.
2. Write your name, student number, and section in the box on this page.
3. Attempt ALL questions.
4. Show all your calculations.
5. Do all your work in the space provided and write the answer in the box for each question. If more space is needed for your work, use the back of the previous page.

Student Name: _____

Student Number:

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Section (see below): _____

Section	Class Time	Instructor	Section	Class Time	Instructor
1	UTH 08:00-09:40	A Al Hammadi	3	UTH 10:00-11:40	M Shahwan
2	UTH 08:00-09:40	M Al Abbas			

Rules Governing Formal Examinations

1. Each candidate must be prepared to produce, upon request, ID card for identification.
2. Candidates are not permitted to ask questions to the invigilators, except in cases of supposed errors or ambiguities in examination questions.
3. Candidates suspected of any of the following, or similar, dishonest practices shall be immediately dismissed from the examination and shall be liable to disciplinary action.
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 - (c) Purposely exposing written papers to the view of other candidates. The plea of accident or forgetfulness shall not be received.
4. Candidates must not destroy or mutilate any examination material; must hand in all examination papers; and must not take any examination material from the examination room without permission of the invigilator.

Page	1	2	3	4	5	6	Total
Max. Marks	12	15	12	14	16	15	80 (+4 Bonus)
Marks Obtained							

University of Bahrain
College of Science
Department of Mathematics
Second Semester 2010/2011
FINAL EXAM

Math 104
Mathematics for Business II

Date: 26th July 2011
Time: 120 Minutes

Instructions to Candidates

1. Check that this exam has 6 questions.
2. Write your name, student number, and section in the box on this page.
3. Attempt ALL questions.
4. Show all your calculations.
5. Do all your work in the space provided and write the answer in the box for each question. If more space is needed for your work, use the back of the previous page.

Student Name:

Student Number:

Section (see below):

Section	Class Time	Instructor	Section	Class Time	Instructor
1	UTH 10:00-10:50	Z Safar	9	UTH 09:00-09:50	M Shahwan
2	UTH 11:00-11:50	Z Safar	10	UTH 11:00-11:50	M Shahwan
3	MW 09:30-10:45	A Matoonq	11	UTH 12:00-12:50	M Shahwan
4	UTH 10:00-10:50	I Khan	12	MW 09:30-10:45	N Metwaly
5	UTH 11:00-11:50	I Khan	14	MW 13:00-14:15	S Abbas
6	UTH 09:00-09:50	F Al Showaikh	15	MW 14:30-15:45	M Al Abbas
7	MW 08:00-09:15	N Metwaly	16	MW 13:00-14:15	N Metwaly
8	MW 09:30-10:45	M Al Abbas	17	UTH 13:00-13:50	I Khan

Rules Governing Formal Examinations

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Page	1	2	3	4	5	6	Total
Max. Marks	17	18	15	18	22	15	100 (+5 Bonus)
Marks Obtained							

1. Choose the correct answer:

[15]

• $\lim_{x \rightarrow \left(\frac{5}{7}\right)} \frac{7}{5} =$ (a) $\frac{49}{25}$ (b) 1

(c) $\frac{5}{7}$ (d) $\frac{7}{5}$

• If $y = e^3 x$ then $\frac{dy}{dx} =$ (a) e^3 (b) $3e^2$

(c) $\frac{e^2 x^2}{2}$ (d) $3e^2 x$

• If $y = \ln x^{-4}$ then $\frac{dy}{dx} =$ (a) $-\frac{4}{x}$ (b) $-\frac{x^{-3}}{3}$

(c) $-4 \ln x^{-3}$ (d) $-4 \ln x$

• If the demand relation is given by $p = 30 - 0.3q$, then the marginal revenue is (a) -0.3 (b) $30 - 0.6q$

(c) $-0.6q$ (d) $30q - 0.6q^2$

• $\int \frac{\sqrt{x+1}}{x} dx =$ (a) $-2\sqrt{x} + \ln|x| + C$ (b) $1/\sqrt{x} + x + C$

(c) $2\sqrt{x} + \ln|x| + C$ (d) $1/\sqrt{x} - x + C$

• $\int x^4 (1 - 2x^5)^6 dx =$ (a) $\frac{(1 - 2x^5)^7}{7} + C$ (b) $\frac{(1 - 2x^5)^7}{-70} + C$

(c) $\frac{x^5 (1 - 2x^5)^7}{7} + C$ (d) $(1 - 2x^5)^7 + C$

• $\int_0^1 (-1) dx =$ (a) 1 (b) 2

(c) $-x$ (d) -1

• $\int_1^2 \frac{d}{dx} (x^x) dx =$ (a) $x^x + C$ (b) x^x

(c) 3 (d) 1

• $\int_1^{10} \frac{9-x}{x-16} dx + \int_{10}^1 \frac{9-x}{x-16} dx =$ (a) 0 (b) 2

(c) 20 (d) 9

• If $\int_{-2}^1 (2x+b) dx = 3$, then (a) $b = 1$ (b) $b = 2$

(c) $b = -1$ (d) $b = -2$

2. (a) The total cost (in hundreds of dollars) of producing x calculators per day is

$$C(x) = 10 + 48\sqrt[3]{2x + 16}.$$

Find $C'(24)$.

[6]

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$C'(24) =$

- (b) The total sales S (in thousands of games) of a home video game t months after the game is introduced are given by

$$S(t) = \frac{90t^2}{t^2 + 50}.$$

Find $S'(t)$ in simplest form.

[6]

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$S'(t) =$

- (c) Find the percentage rate of change of $f(x) = 15x + 2x \ln x$ at $x = e$.

[6]

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PRC =

3. Determine where the function $f(x) = 2 - 9x + 6x^2 - x^3$ is increasing, decreasing, concave up, and concave down. Also, find all relative extrema and points of inflection, and sketch the graph. [12]

Lined area for student response, consisting of approximately 30 horizontal dashed lines.

5. (a) Evaluate the following integrals.

(i) $\int x^2 e^{5x^3-6} dx.$

[4]

$$\int x^2 e^{5x^3-6} dx =$$

(ii) $\int \frac{\ln x}{x} dx.$

[4]

$$\int \frac{\ln x}{x} dx =$$

(iii) $\int \frac{1-2x}{5+x-x^2} dx.$

[4]

$$\int \frac{1-2x}{5+x-x^2} dx =$$

(b) Find the average value of the function $f(x) = \frac{x^2}{2}$ over $[-3,6]$.

[4]

$$\bar{f} =$$

6. (a) Find the area of the region bounded by $y = x^2 + 2$ and $y = 2x + 5$. [7]

Area =

- (b) Find the consumers' surplus and producers' surplus at the equilibrium price level if the demand function and supply function are given by [8]

$$D: p = 25 - 5q$$

$$S: p = 7 + 2q^2$$

CS = PS =

3. Find $\frac{dy}{dx}$ and simplify:

(i) $y = \ln(x^2) + \ln^3 x$.

[4]

$$\frac{dy}{dx} =$$

(ii) $y = e^{\sqrt{2x+1}}$.

[4]

$$\frac{dy}{dx} =$$

(iii) $\ln(xy) + y = 2$.

[4]

$$\frac{dy}{dx} =$$

6. (a) Evaluate: $\int_{-1}^2 f(x) dx$ where $f(x) = \begin{cases} 1 - 2x^3 & \text{if } x \leq 1 \\ 5x^2 - 6 & \text{if } x \geq 1 \end{cases}$ [4]

	\int_{-1}^2
	$f(x) dx =$
	-1

- (b) Find the **area** of the region bounded by the curves $y = 4 - x^2$, $y = 2x^2 + 1$, $x = 0$ and $x = 3$. [8]

Area =

6. (a) Given the supply function $p = S(q) = 10(e^{0.02q} - 1)$ find the average price (in dollars) over the supply interval $[20, 30]$. [7]

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$\bar{S} =$

- (b) Suppose the demand and supply relations are given by [8]

$$D: p = 25 - 0.001q^2$$
$$S: p = 5 + 0.1q.$$

Calculate consumers' surplus and producers' surplus under market equilibrium.

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CS =	PS =
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3. Determine where the function $f(x) = 2x^3 - 9x^2 + 12x - 2$ is increasing, decreasing, concave up, and concave down. Also, find all relative extrema and points of inflection, and sketch the graph. [12]

6. (a) Find the **area** of the region bounded by the curves $y = 9 + 4x - x^2$ and $y = x^2 - 2x + 1$. [7]

Area =

- (b) Suppose the demand and supply relations are given by [6]

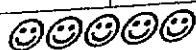
$$D: p = 900 - q^2$$

$$S: p = 10q + 300.$$

Calculate consumers' surplus and producers' surplus under market equilibrium.

CS =

PS =



4. (a) Suppose that the demand equation is given by $p = 400 - 2q$ and the cost function is $c(q) = 0.2q^2 + 4q + 400$. [8]
- (i) Determine number of units that must be produced and sold to maximize the profit.
- (ii) Determine the price at which maximum profit occurs.
- (iii) Determine the maximum profit.

(i)	(ii)	(iii)
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- (b) The sole producer of a product has determined that the marginal revenue function is $\frac{dr}{dq} = 100 - 3q^2$. Determine the point of elasticity of demand for the product when $q = 5$. [Hint: First find the demand function] [7]

Ans:

5. Evaluate the following integrals.

(i) $\int \frac{x+2}{x^2+4x-2} dx.$ [3]

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$$\int \frac{x+2}{x^2+4x-2} dx =$$

(ii) $\int \frac{7x^3}{e^{x^4}} dx.$ [3]

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$$\int \frac{7x^3}{e^{x^4}} dx =$$

(iii) $\int 6x^6(6-x^7)^{66} dx.$ [3]

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$$\int 6x^6(6-x^7)^{66} dx =$$

(iv) $\int (8+8^x) dx.$ [3]

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$$\int (8+8^x) dx =$$

6. (a) Evaluate: $\int_{-1}^2 f(x) dx$ where $f(x) = \begin{cases} 1-2x^3 & \text{if } x \leq 1 \\ 5x^2 - 6 & \text{if } x \geq 1 \end{cases}$ [4]

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$$\int_{-1}^2 f(x) dx =$$

(b) Find the area of the region bounded by the curves $y = 4 - x^2$, $y = 2x^2 + 1$, $x = 0$ and $x = 3$. [8]

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Area =

University of Bahrain
College of Science
Department of Mathematics
Second Semester 2009/2010
Test 3

Math 104
Mathematics for Business II

Date: 26th May 2010
Time: 60 Minutes

Instructions to Candidates

1. Check that this exam has 3 questions.
2. Write your name, student number, and section in the box on this page.
3. Attempt ALL questions.
4. Show all your calculations.
5. Do all your work in the space provided and write the answer in the box for each question. If more space is needed for your work, use the back of the previous page.

Student Name: _____

Student Number: _____

Section (see below): _____

Section	Class Time	Instructor
1	MW 08:00-09:15	M Aiyub
2	MW 08:00-09:15	N Metwally
3	MW 09:30-10:45	S Al Qassar
4	MW 09:30-10:45	A Matooq
5	UTH 10:00-10:50	Z Safar
6	MW 14:30-15:45	M Al Abbas
7	UTH 08:00-08:50	M Shahwan
8	UTH 10:00-10:50	M Shahwan

Section	Class Time	Instructor
9	UTH 09:00-09:50	M Shahwan
10	UTH 11:00-11:50	N Metwally
11	UTH 10:00-10:50	I Khan
12	UTH 11:00-11:50	Z Safar
13	UTH 11:00-11:50	I Khan
14	UTH 11:00-11:50	F Al Shawaikh
15	MW 09:30-10:45	N Metwally

Rules Governing Formal Examinations

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Page	1	2	3	Total
Max. Marks	10	15	15	40
Marks Obtained				

2. Evaluate the following

(i) $\int (2x+1)(x^2+x)^3 dx$.

[5]

$$\int (2x+1)(x^2+x)^3 dx =$$

(ii) $\int \frac{5e^{3x}}{8e^{3x}+3} dx$.

[5]

$$\int \frac{5e^{3x}}{8e^{3x}+3} dx =$$

(iii) $\int \frac{1+\ln x}{x} dx$.

[5]

$$\int \frac{1+\ln x}{x} dx =$$

2. Evaluate the following

(i) $\int (2x+1)(x^2+x)^3 dx.$

[5]

$$\int (2x+1)(x^2+x)^3 dx =$$

(ii) $\int \frac{5e^{3x}}{8e^{3x}+3} dx.$

[5]

$$\int \frac{5e^{3x}}{8e^{3x}+3} dx =$$

(iii) $\int \frac{1+\ln x}{x} dx.$

[5]

$$\int \frac{1+\ln x}{x} dx =$$

2. (a) Find $\frac{dy}{dx}$ in the following: [Simplify your answer]

(i) $y = (1+2x)^4 e^{2x^3}$. [5]

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$\frac{dy}{dx} =$

(ii) $y = \frac{\ln x}{x^3}$. [5]

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$\frac{dy}{dx} =$

(b) For $y = f(x) = \frac{5}{x}$ evaluate $\frac{d^4 y}{dx^4}$ at $x = -2$. [5]

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$f^{(4)}(-2) =$

3. Differentiate the following. [Simplify your answer]

(i) $y = (2-x^3)^4 (1+3x^2)^5$ [5]

$$\frac{dy}{dx} =$$

(ii) $y = \frac{1+e^{3x}}{x^3}$ [5]

$$\frac{dy}{dx} =$$

(iii) $y = \ln \frac{\sqrt{5+x^4} (1+5x)^2}{(6-x)^3}$ [5]

$$\frac{dy}{dx} =$$

1. (a) Find $\frac{dy}{dx}$ in the following:

(i) $y = \frac{(1-2x^2)^3(5+x)^4}{\sqrt{9-7x}}$

[3]

$$\frac{dy}{dx} =$$

(ii) $y = (2-x)^x$

[3]

$$\frac{dy}{dx} =$$

(b) Find $\frac{d^3y}{dx^3}$ if $y = x \ln x$

[3]

$$\frac{d^3y}{dx^3} =$$

1. (a) Evaluate $\lim_{x \rightarrow -1} \frac{x^2 - 3x - 4}{x^2 + 5x + 4}$. [4]

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Ans:

(b) Use the definition to find the derivative of $y = 8 - 3x^2$. [5]

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$\frac{dy}{dx} =$

(c) Find the slope of the tangent line to the graph of $y = x^{31} - x^2 - \sqrt{2}$ at $x = 1$. [4]

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Ans:

3. (a) The demand equation for a product is given by $p = 15 - 0.5q^{1.5}$ where q is the number of units that can be sold at a price of BD p . Find the marginal revenue at $q = 4$. [4]

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<i>Ans:</i>

- (b) Find the percentage rate of change of $f(x) = \sqrt{x^3 - 4}$ when $x = 2$. [5]

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<i>Ans:</i>

- (c) For the demand equation $p = \frac{3000}{q^2 + 100}$, determine whether demand is elastic, is inelastic, or has unit elasticity at the indicated values of q : [6]
- (i) $q = 10$. (ii) $q = 20$.

<i>Ans:</i> (i)	(ii)
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University of Bahrain
College of Science
Department of Mathematics
Summer 2009/2010
Test 1

Math 104
Mathematics for Business-II

Date: 08th April 2009
Time: 60 Minutes

Student Name: _____

Student Number: _____

Section: _____

Page	1	2	3	Total
Max. Marks	10	10	10	30
Marks Obtained				

3. Differentiate the following. [Simplify your answer]

(i) $y = (2 - x^3)^4 (1 + 3x^2)^5$

[5]

$$\frac{dy}{dx} =$$

(ii) $y = \frac{1 + e^{3x}}{x^3}$

[5]

$$\frac{dy}{dx} =$$

(iii) $y = \ln \frac{\sqrt{5+x^4} (1+5x)^2}{(6-x)^3}$

[5]

$$\frac{dy}{dx} =$$

1. Choose the correct answer:

[10]

- $\lim_{x \rightarrow -3} \frac{x^2 + 3x}{x + 3} =$

- (a) $\frac{0}{0}$ (b) -3 (c) 3 (d) 9

- $\frac{d}{dx} \ln 3x =$

- (a) $\frac{1}{x}$ (b) $\frac{1}{3x}$ (c) $\frac{1}{\ln 3x}$ (d) $\frac{3}{x}$

- $\frac{d^3}{dx^3} (x+2)e^x =$

- (a) e^x (b) xe^x (c) $(x+3)e^x$ (d) $(x+5)e^x$

- The percentage rate of change of $f(x) = 4x^3 + 3x - 2$ when $x = 1$ is

- (a) 3% (b) 15% (c) 30% (d) 300%.

- If $3x^6 + 2y^3 = 5$, then $\frac{dy}{dx} =$

- (a) $-\frac{3y^2}{x^5}$ (b) $-\frac{y^2}{3x^5}$ (c) $-\frac{3x^5}{y^2}$ (d) $-\frac{x^5}{3y^2}$

3. (a) The demand equation and the cost function for a manufacturer's product are given, respectively, by

$$p = 15 - \ln q \text{ and } c(q) = 0.3q^2 + 7q + 200$$

where q is the number of units that can be sold at a price of BD p .

- (i) Find the marginal cost at $q = 10$.

[2]

<i>Ans:</i>

- (ii) Find the marginal revenue at $q = 10$.

[3]

<i>Ans:</i>

- (b) For the demand equation $p = 50e^{-q/300}$, find the point of elasticity and determine whether demand is elastic, is inelastic, or has unit elasticity at:

(i) $p = 300$.

(ii) $p = 500$.

[6]

<i>Ans:</i> (i)	(ii)
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3. (a) The demand equation and the cost function for a manufacturer's product are given, respectively, by

$$p = 100 - 0.5q \text{ and } c(q) = 0.25q^2 + 2q + 5$$

where q is the number of units that can be sold at a price of BD p . Find the marginal profit at $q = 50$.

[4]

Ans:

- (b) For the demand equation $q = 600 - 0.05p^2$, determine whether demand is elastic, is inelastic, or has unit elasticity at the indicated values of p :

(i) $p = 100$.

(ii) $p = 50$.

[6]

Ans: (i)

(ii)

3. Evaluate the following:

(i) $\int (6+x-3x^5) dx$

[3]

$$\int (6+x-3x^5) dx =$$

(ii) $\int \frac{1+x}{\sqrt{5+2x+x^2}} dx$

[4]

$$\int \frac{1+x}{\sqrt{5+2x+x^2}} dx =$$

(iii) $\int_4^9 (\sqrt{x}-0.2) dx$

[4]

$$\int_4^9 (\sqrt{x}-0.2) dx =$$

I. Choose the correct answer: [8]

• The demand relation is inelastic if

- (a) $n = -1$.
- (b) $n > -1$.

- (c) $n < -1$.
- (d) None of these.

• If $y = 10^x$ then $\frac{d^2 10^x}{dx^2} =$

- (a) 10^x .
- (b) $10^x \ln x$.
- (c) $10^x (\ln 10)^2$.
- (d) None of these.

• If $f(x) = \frac{1}{x-3}$ then f has

- (a) one critical number; $x = 3$.
- (b) one critical number; $x = 0$.
- (c) no critical numbers.
- (d) None of these.

• If $f(x) = x^5 + x$ then f

- (a) decreasing on $(-\infty, \infty)$.
- (b) increasing on $(-\infty, \infty)$.
- (c) decreasing on $(-\infty, 0)$; increasing on $(0, \infty)$.
- (d) None of these.

University of Bahrain
 College of Science
 Department of Mathematics
 Summer 2009/2010
 Test 1

Math 104
Mathematics for Business II
 Date: 08th April 2009
 Time: 60 Minutes

Student Name: _____
 Student Number: _____
 Section: _____

Page	Max. Marks	Marks Obtained
1	10	
2	10	
3	10	
Total	30	

2. Find $\frac{dy}{dx}$ in the following: (Simplify your answer)

(i) $y = (5-4x)^2(3+x^2)^5$.

[3]

$$\frac{dy}{dx} =$$

(ii) $y = \frac{(1+5x)^3}{7-x^2}$.

[3]

$$\frac{dy}{dx} =$$

(iii) $f(x) = \ln \sqrt{\frac{1-2x}{1+2x}}$.

[4]

$$\frac{dy}{dx} =$$

1. Choose the correct answer:

[9]

$$\lim_{x \rightarrow -2} \frac{x^2 + x - 2}{x + 2} =$$

- (a) $\frac{0}{0}$ (b) -3 (c) Does not exist (d) None of these.

$$\lim_{x \rightarrow 0} 104 =$$

- (a) 0 (b) 104 (c) Does not exist (d) None of these.

$$\frac{d}{dx} \sqrt{9} =$$

- (a) 0 (b) 3 (c) -3 (d) None of these.

$$\frac{d}{dx} \left(\frac{x}{3} \right) =$$

- (a) $\frac{3-x}{9}$ (b) $\frac{1}{0}$ (c) $\frac{1}{3}x$ (d) None of these.

If $p = 100 - 0.1q$ is the demand relation then the ^{marginal} revenue function is

- (a) -0.1 (b) 99.9 (c) $100 - 0.2q$ (d) None of these.

The percentage rate of change of $f(x) = e^{2x}$ when $x = 0.05$ is

- (a) 200% (b) 2 (c) 5% (d) None of these.

**University of Bahrain
College of Science
Department of Mathematics
First Semester 2010/2011
Test I**

**Math 104
Mathematics for Business II**

**Date: 02nd Nov 2010
Time: 60 Minutes**

Instructions to Candidates

1. Check that this exam has 3 questions.
2. Write your name, student number, and section in the box on this page.
3. Attempt ALL questions.
4. Show all your calculations.
5. Do all your work in the space provided and write the answer in the box for each question. If more space is needed for your work, use the back of the previous page.

Student Name:

Student Number:

Section (see below):

Section	Class Time	Instructor	Section	Class Time	Instructor
1	UTH 09:00-09:50	M Al Abbas	9	UTH 09:00-09:50	N Metwally
2	UTH 10:00-10:50	I Khan	10	MW 09:30-10:45	F Al Showaikh
3	UTH 11:00-11:50	I Khan	11	UTH 13:00-13:50	M Shahwan
4	MW 08:00-09:15	M Al Abbas	12	MW 13:00-14:15	M A.Aaty
5	UTH 10:00-10:50	Z Safar	13	UTH 08:00-08:50	A Al Mannai
6	UTH 11:00-11:50	Z Safar	14	UTH 09:00-09:50	M A.Aaty
7	UTH 08:00-08:50	M Shahwan	15	UTH 12:00-12:50	M Al Abbas
8	UTH 09:00-09:50	M Shahwan	16	UTH 13:00-13:50	I Khan

Rules Governing Formal Examinations

1. Each candidate must be prepared to produce, upon request, ID card for identification.
2. Candidates are not permitted to ask questions to the invigilators, except in cases of supposed errors or ambiguities in examination questions.
3. Candidates suspected of any of the following, or similar, dishonest practices shall be immediately dismissed from the examination and shall be liable to disciplinary action.
 - (a) Having at the place of writing any books, papers or memoranda.
 - (b) Speaking or communicating with other candidates.
 - (c) Purposely exposing written papers to the view of other candidates. The plea of accident or forgetfulness shall not be received.
4. Candidates must not destroy or mutilate any examination material; must hand in all examination papers; and must not take any examination material from the examination room without permission of the invigilator.

Page	1	2	3	Total
Max. Marks	10	9	11	30
Marks Obtained				

1. (a) Evaluate $\lim_{x \rightarrow -1} \frac{x^2 - 3x - 4}{x^2 + 5x + 4}$. [4]

Ans:

- (b) Use the definition to find the derivative of $y = 8 - 3x^2$. [5]

$\frac{dy}{dx} =$

- (c) Find the slope of the tangent line to the graph of $y = x^{31} - x^2 - \sqrt{2}$ at $x = 1$. [4]

Ans:

3. (a) Find the absolute maximum and absolute minimum values of $f(x) = x^3 + 3x^2 - 9x - 7$ on the interval $[-2, 2]$. [7]

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Ans:

- (b) Determine concavity and the x -values where points of inflection occur. [7]

$$y = 2x^4 - 48x^2 + 7x + 3.$$

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Ans:

3. Find each indefinite integral:

(i) $\int \frac{x+1}{\sqrt{x^2+2x+3}} dx.$ [3]

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$$\int \frac{x+1}{\sqrt{x^2+2x+3}} dx =$$

(ii) $\int \frac{3x^7}{5-2x^8} dx.$ [3]

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$$\int \frac{3x^7}{5-2x^8} dx =$$

(iii) $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx.$ [3]

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$$\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx =$$

1. (a) Find all critical numbers of $f(x) = \frac{x^2 + 9}{x}$. [3]

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Ans:

- (b) If $f(x) = 2x^3 + 3x^2 - 36x + 1$, determine the intervals on which f is increasing and the intervals on which f is decreasing. [3]

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Increasing on:

Decreasing on:

- (c) The cost function for a cookie store is given by $c(q) = q^3 - 6q^2 + 250$, where q is the number of cookies made. Find the absolute extrema on the interval $[0, 8]$. [3]

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Ans: