



MASENO UNIVERSITY
UNIVERSITY EXAMINATIONS 2015/2016

**FIRST YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE
OF BACHELOR OF SCIENCE AND BACHELOR OF EDUCATION WITH
INFORMATION TECHNOLOGY**

MAIN CAMPUS

MMA 107: MATHEMATICS II


Date: 26th April, 2016

Time: 8.30 - 10.30am

INSTRUCTIONS:

- Answer Question ONE and any other TWO Questions.

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ISO 9001:2008 CERTIFIED 

Question 1: Compulsory (30 marks)

Question 2 (20 marks)

- a) Find the turning points of the curve $y = 4x^3 - 15x^2 - 18$. Hence determine the maximum and minimum of y . (13mks)
- b) Use implicit differentiation to find $\frac{dy}{dx}$ given that $y^3 + y^2 - 5y - x^2 = -4$ (4mks)
- c) Evaluate the limits

$$\lim_{x \rightarrow 2} \frac{4(x^2 - 4)}{x - 2}$$

(3mks)

Question 3 (20 marks)

- a) Let $f(x) = (x - 2)(8 - x)$ for $2 \leq x \leq 8$.

- Find $f(6)$ and $f(-1)$.
- What is the domain of definition of $f(x)$.
- Find $(1 - 2t)$ and give the domain of the definition.
- Find $f(f(3))$ (10mks)

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- b) At a time $t = 0$, a diver jumps from a diving board that is 32 feet above the water. The position of the diver is given by $S(t) = -16t^2 + 16t + 32$

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 - Find $(1 - 2t)$ and give the domain of the definition.
 - Find $f(f(3))$ (10mks)
- b) At a time $t = 0$, a diver jumps from a diving board that is 32 feet above the water. The position of the diver is given by $S(t) = -16t^2 + 16t = 32$ where S is measured in feet and t is measured in seconds.
- When does the diver hit the water?
 - What is the diver's velocity at impact? (7mks)
- c) Solve the first order differential equation $\frac{dy}{dx} = \frac{y}{1+x}$ (3mks)

Question 4 (20 marks)

- a) Determine the area of the region bounded by $y = 2x^2 + 10$; $y = 4x + 16$; $x = -2$ and $x = 5$ (10mks)
- c) Find $\frac{dy}{dx}$ for $y = (x^2 + 1)^3$ (4mks)
- d) Find the equation of the tangent and the equation of the normal to the curve $y = x^3 + 2x + 1$ at a point $(1, 4)$. (6mks)

Question 5 (20 marks).

- a) A ball is thrown upwards with a velocity of $40m/s$.
- Determine expressions in terms of t for its velocity and its height above the point of projection.
 - Find the velocity and height after: 2 seconds; 5 seconds and 8seconds.
 - Find the maximum height attained by the ball. (Take acceleration due to gravity to be $10m/s^2$)

(15mks)

- b) Solve the second order homogeneous equation

$$y' - y'' - 12y = 0$$

for $y(x)$ (5mks)