



UNIVERSITY OF JOHANNESBURG
FACULTY OF SCIENCE

DEPARTMENT OF PURE AND APPLIED MATHEMATICS

MODULE	MAT1D01 ADVANCED BIO AND ENVIRO MATHS STATS
CAMPUS	APK
TEST	NOVEMBER EXAM
DATE	01/11/2014

PART A: CALCULUS

EXAMINER	MR. V. VAN APPEL
INTERNAL MODERATOR	MRS. C. DUNCAN
DURATION	1 HOUR
MARKS	35

SURNAME AND INITIALS _____

STUDENT NUMBER _____

CONTACT NUMBER _____

NUMBER OF PAGES: 6 + COVER PAGE

INSTRUCTIONS:

1. ANSWER ALL QUESTIONS ON THE PAPER IN PEN.
2. CALCULATORS ARE ALLOWED.
3. INDICATE CLEARLY ANY ADDITIONAL WORKING OUT.

1. Answer the following multiple choice questions and write your answer in the table provided below:

Question	Answer
1.1	
1.2	

1.1. If $2x \leq g(x) \leq x^4 - x^2 + 2$ for all x , then the $\lim_{x \rightarrow 1} g(x)$ is: [4]

- a) 0
- b) 2
- c) 1
- d) undefined

1.2. The derivative of a^x , where a is a positive real number ($a \neq 1$) is:

- a) a^x
- b) undefined
- c) $a^x \ln x$
- d) $a^x \ln a$

2. Find the derivative of the following functions

2.1. $f(x) = \ln(\sin^2 x)$

[3]

2.2. $y = (\cos x)^x$

[4]

3. Biologist stocked a lake with 400 fish. The number of fish tripled in the first year. Assuming the size of the fish population satisfies the exponential growth/decay model, find an expression for the size of the population after t years.

[4]

4. Evaluate the following integral

$$\int \frac{\sec^2 \sqrt{x}}{\sqrt{x}} dx$$

[3]

5. Find the limit.

5.1. $\lim_{x \rightarrow 0} \frac{\sin x}{x + \tan x}$

[3]

5.2. $\lim_{x \rightarrow \infty} x^{1/x}$

[4]

6. Find the volume of the solid obtained by rotating the region bounded by $y = x$ and $y = \sqrt{x}$, about the y -axis

[5]

7. A farmer wants to fence an area of 1500 m^2 in a rectangular field and then divide it in half with a fence parallel to one of the sides of the rectangle. How can he do this so as to minimize the cost of the fence.

[5]