JOHANNESBURG

## FACULTY OF SCIENCE

## DEPARTMENT OF MATHEMATICS AND APPLIED MATHEMATICS <br> MODULE: MATHEMATICS FINANCE AND BUSINESS 1B- MATDCB1 <br> CAMPUS: APK / SWC <br> ASSESSMENT: SUPPLEMENTARY EXAMINATION 2021

DATE:

| ASSESSORS: | DR A ALOCHUKWU |
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|  | DR P GATABAZI |
|  | MR T MOHUBEDU |
|  |  |
| INTERNAL MODERATOR: | MS M JUGA |
| DURATION. | 2 HOURS +1 HOUR |

INITIALS AND SURNAME:
STUDENT NUMBER:
2 HOURS + 1 HOUR
$\qquad$
$\qquad$
CONTACT NUMBER: $\qquad$

NUMBER OF PAGES: 6 (INCLUDING COVER PAGE)

INSTRUCTIONS:

- ANSWER ALL THE QUESTIONS IN PEN.
- ALL GRAPHS MUST BE DRAWN IN PEN.
- NO PENCIL OR TIPEX ALLOWED.
- SHOW ALL THE NECESSARY CALCULATIONS CLEARLY.
- IF FORMULAS ARE USED THEY MUST BE STATED AS MARKS ARE GIVEN TO THEM.
- ONLY SCIENTIFIC CALCULATORS ARE ALLOWED.
- IF NECESSARY, ROUND OFF TO TWO DECIMAL PLACES.
- THE QUESTIONS CAN BE ANSWERED IN ANY ORDER.

Question 1 (This question will be answered directly on blackboard)

Choose the correct answer by writing only the corresponding letter (e.g 1.1. A
1.2. C
etc.)
1.1. An amount of R 40000 is deposited at the savings account with the interest rate of $10 \%$ compounded monthly. How many years will it take to totalise R 120 000?
A. $\quad 10.03$ years
B. $\quad 11.03$ years
C. $\quad 11.00$ years
1.2. An amount of $R 100000$ is deposited into the savings account with a rate of $0.1 \%$ compounded continuously. How much will be the amount in 6 years?
A. R 182211.88
B. R 200211.88
C. $\quad \mathrm{R} 92211.88$
1.3. Find the present value of an annuity of R 2500 paid monthly for five years at the rate of $6 \%$ compounded monthly.
A. $\quad$ R 42921.60
B. R 57809.17
C. R 175297.20
D. $R 129313.90$
1.4. Find the present value of an annuity of $R 2500$ semi-annually for four years and thereafter R 3150 semi-annually for one year. Given an interest rate of $7.5 \%$ compounded semi-annually.
A. $\quad \mathrm{R} 21448.46$
B. R 30292.1
C. R 130318.80
D. $R 22969.54$
1.5. Find an equation of the tangent line to the curve $y=3 x^{2}-4 x+1$ at the point where $x=0$
A. $y=4 x-1$
B. $y=-4 x+4$
C. $y=-4 x-1$
D. $y=4 x-4$
1.6. Find the derivative of the function $f(x)=\frac{x^{2}}{2}+\frac{3}{x^{3}}$.
A. $f^{\prime}(x)=x+\frac{1}{x^{2}}$
B. $f^{\prime}(x)=4 x+\frac{1}{x^{2}}$
C. $f^{\prime}(x)=x-\frac{9}{x^{4}}$
D. $f^{\prime}(x)=x+\frac{9}{x^{4}}$
1.7. The slope of the curve $y=\left(x^{2}-4\right)\left(x^{2}+4\right)$ at $x=1$ is equal to:
A. 0
B. 1
C. 4
1.8. Given $X \sim N(25,16)$, find $P(X>18)$.
A. 0.9599
B. 0.0401
C. 0.4599
D. 0.3300
1.9. The standard deviation of the series: 2468 is:
A. $\sqrt{7}$
B. $\sqrt{5}$
C. $\sqrt{2}$
1.10. Given the following probabilities: $P(A)=0.2 ; P(B)=0.5$ and knowing that events A and B are independent; $P(A U B)$ is equal to:
A. 0.6
B. 0.4
C. 0.06

## Question 2

2.1. How many years will it take a deposit of R 20000 to increase to $R 25000$ if invested at an interest rate is $6 \%$ compounded annually?
2.2. An investment company offers a continuous interest rate of $6 \%$. If R 15000 may be accumulated after 3 years, find a required principal.

## Question 3

A debt of R 600000 due six years from now is to be repaid by a payment of R 150000 in three years, a payment of $R 250000$ in four years, and a final payment at the end of five years. Interest rate is 7\% compounded annually.
3.1. Draw a time line that shows all debts and payments.
3.2. Determine the final payment.

## Question 4

A business guarantees you cash flows of R 85000 , R 90000 and R 115000 at the end of years 4,6 and 7 respectively if you invested R 220000 . Find the net present value of the cash flows if the interest rate is $8 \%$ compounded semi-annually.

## Question 5

Determine the third derivative of: $y=\frac{x+2}{x-3}$

## Question 6

Find an equation of the tangent line to the curve $y=x^{3} \ln (2-x)$ at $x=1$.

## Question 7

Suppose the National Grade 12 Mathematics marks of a country are normally distributed with mean of $38 \%$ and standard deviation of $4 \%$. Find the probability of selecting a Grade 12 learner, at random, that obtained a mark less than $49 \%$.

## Question 8

A six-sided die is rolled, and the following events are considered:
$A=$ Obtaining an odd number.
$B=$ Obtaining a number greater than 4.
8.1. Calculate the probabilities $P(A), P(B)$.
8.2. Write down the elements of $A \cap B$ in set form
8.3. Calculate the following probabilities:
i) $P(A \cup B)$
ii) $P(\overline{A \cup B})$

## Question 9

A symmetric coin is tossed three times.
9.1. Use a tree diagram to show all the possible outcomes as head $(H)$ or tail (T).
9.2. Find the probability of obtaining at least 2 heads.

