UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

UNIVERSITEIT
VAN
JOHANNESBURG

DEPARTMENT OF PURE AND APPLIED MATHEMATICS

MODULE **MAT2EC1 / MAT1C2E** (CALCULUS SECTION)
BIO & ENVIRO MATHS AND STATS

CAMPUS **APK**

EXAM **NOVEMBER 2017**

DATE: 22 NOVEMBER 2017 **SESSION:** 12:30 – 14:30

ASSESSOR: MR. T. MOHUBEDU

INTERNAL MODERATOR: MR. V. VAN APPEL

DURATION: 60 MINUTES **MARKS:** 50

SURNAME AND INITIALS: ______________________________

STUDENT NUMBER: ______________________________

CONTACT NUMBER: ______________________________

Please read the following instructions carefully

1. Answer all questions on the paper in pen.
2. This paper consists of 10 pages including the cover page.
3. **Show all calculations.**
4. **Calculators are allowed.**

1 Given $f(x) = x^2 + 4$ and $g(x) = x - 1$.

1.1 Does the point $(-2, 0)$ lie on the graph of f? [1]

1.2 Find the value of $(f \cdot g)(0)$ [2]

1.3 Find the composition $f \circ g$ [2]

2 Use the laws of exponents to simplify: $0.2^2 \cdot 5^3$ [2]

3 Solve for x: $10e^{x+1} = e^{2x}$ [3]

4. Find the equation of the straight line that is passing through the points $(-2, 1)$ and $(3, 0)$. [2]

5. Set up a table to estimate the limit: $\lim_{t \to 0} \frac{\sin(t)}{2t}$ [2]

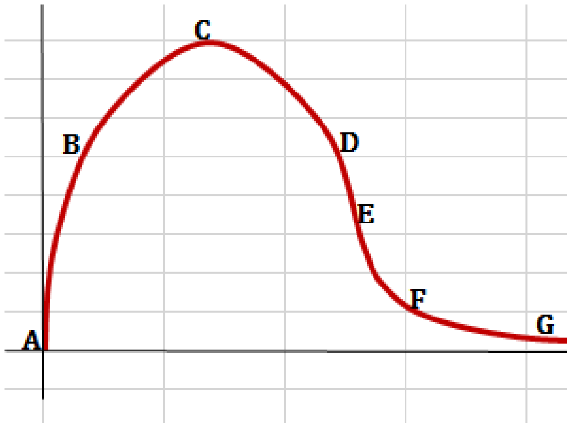
6 Find a point on the given graph: [4]

6.1 where the derivative is zero,

6.2 where the derivative is positive,

6.3 where the derivative is negative,

6.4 with maximum derivative,



7 Given $f(x) = x^2 + 2x$

7.1 Find $f'(x)$ [1]

7.3 Give the interval of increase and decrease. [2]

8 The temperature of a room (T) is a function of how far the window is open $(W$, $in\ cm^2)$ according to T (W)= 35− 2.7W . How long you sleep $(P$, measured in hours) is a function of the temperature according to $P(T) = 16.5 - 0.4T$

8.1 What is the maximum temperature of the room? [1]

8.2 Find the formula of how long you sleep as a function of how far the window is open. [2]

8.3 Find the formula of how far the window is open as a function of how long you sleep. [2]

9 A population follows the discrete – time dynamical system $b_{t+1} = rb_t$ with $r = 1.42$ and $b_0 = 2.0$.

9.1 Is the population increasing or decreasing? [1]

9.2 Express the solution $b(t)$ of the system in exponential form.. [1]

9.2 Sketch the graph of the solution $b(t)$ for $0 \leq t \leq 5$. [3]

10 A population has a doubling – time of 3 years and an initial size of 4×10^3.

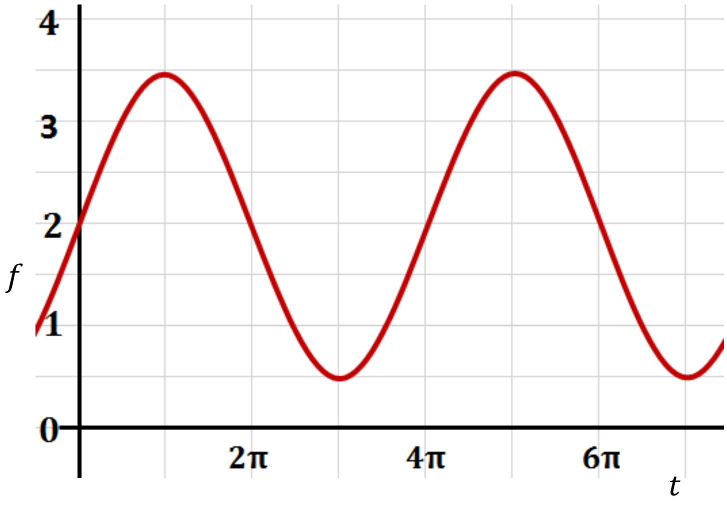
10.1 What is the population in 12 years? [1]

10.2 Find the equation for population size $P(t)$ as a function of time. [3]

10.3 Find the average rate of change in population size during the third half hour. [3]

11. Considering the given sinusoidal graph of f, find [3]

11.1 the phase,



11.2 the period,

11.3 the amplitude,

11.4 the average,

11.5 and the equation of f

12 Given $f(t) = 2 + 2\cos(\pi t - 1.571)$

12.1 Write f in standard form [1]

12.2 Sketch the graph of f for $0 \leq t \leq 3$. [3]

13 Sketch the graph of $f(t) = e^{0.25t}\cos\left(\frac{\pi t}{2}\right)$ for $0 \le t \le 8$. [5]

----------------- [TOTAL 50]