UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS AND APPLIED MATHEMATICS

MODULE	**MAT2EB1\MAT1A2E**
CAMPUS	**APK**
ASSESSMENT	**Examination** (ONLINE DUE TO COVID-19)

DATE 2022/01/17	**TIME 08H00—11H00**
ASSESSOR(S)	**MR T CHIKORE** **MR L MATSEBULA** **MS M SEBOGODI**
MODERATOR	**DR ROBINSON**
DURATION	**SECTION A: 75 MINUTES** **SECTION B: 75 MINUTES**
	MARKS 75

SURNAME AND INITIALS _____

STUDENT NUMBER _____

NUMBER OF PAGES: 3 PAGES, INCLUDING COVER PAGE

INSTRUCTIONS:

1. **ANSWER ALL THE QUESTIONS ON THE PAPER IN PEN.**
2. **NO CALCULATORS ARE ALLOWED.**
3. **SHOW ALL CALCULATIONS AND MOTIVATE ALL ANSWERS.**
4. **YOU HAVE TO COMPLETE BOTH SECTION A AND B! YOU MUST START WITH SECTION A. SECTION B WILL ONLY BE AVAILABLE AT 13H00.**
5. **THE SUBMISSION LINK ON BB WILL BE TAKEN DOWN AT 15H30.**
6. **DO NOT EMAIL YOUR ANSWERS TO THE LECTURERS, THEY WILL NOT BE MARKED. YOU HAVE BEEN GIVEN TWO ATTEMPTS TO UPLOAD SECTION B ON BLACKBOARD. ONLY THE LAST ATTEMPT WILL BE MARKED**

Mathematics and Applied Mathematics

Calculus of One Variable Functions
Examination
SECTION B

MAT2EB1\MAT1A2E: 2022-01-17

Time: 08H00—11H00 **Marks:** 35
Assessors: Mr. Chikore, Mr. Matsebula and Ms. Sebogodi
Moderator: Dr Robinson

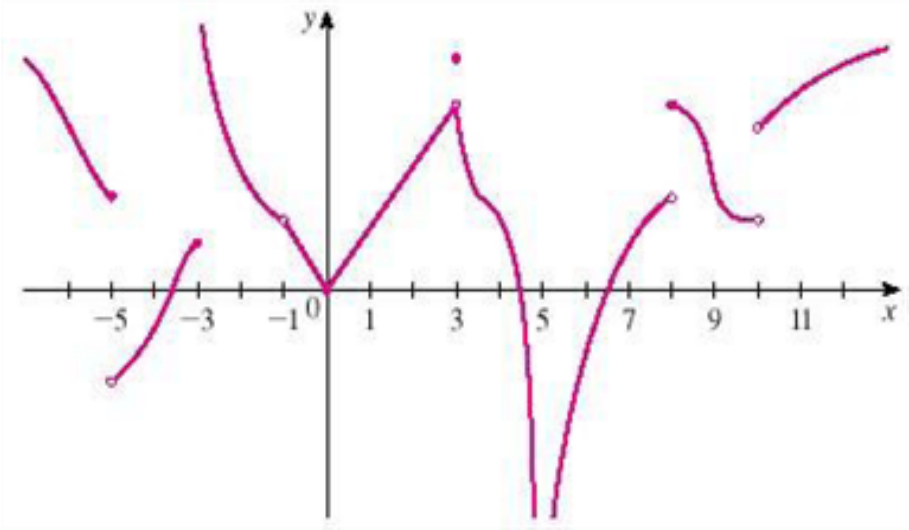

Figure 1: The graph of $f(x)$.

Question 1 [10 mark(s)]
Use Figure 1 to answer the following questions. Do not justify.

(a) Does the limit from the left of f at -5 exist? (2)
(b) Does the limit from the right of f at -5 exist? (2)
(c) Does the limit of f at -5 exist? (2)
(d) Is f continuous from the left at -5? (2)
(e) Is f continuous from the right at -5? (2)

Question 2 [4 mark(s)]
Find the derivative of the function
$y = \dfrac{2x}{4-x}$

Question 3 [17 mark(s)]

Evaluate the following limits.

(a) $\lim_{x\to\infty} \dfrac{5x^2+2}{x\sqrt{3x^2+1}}$ (4)

(b) $\lim_{x\to\infty} \dfrac{\sinh(8x)}{6e^{8x}}$ (4)

(c) $\lim_{x\to 0} \dfrac{7^x-3^x}{x}$ (4)

(d) For the following question, use $f(x)=|2x-5|$ to evaluate the following limits.

(I) $\lim_{x\to\frac{5}{2}^+} \dfrac{f(x)-f(\frac{5}{2})}{x-\frac{5}{2}}$ (2)

(II) $\lim_{x\to\frac{5}{2}^-} \dfrac{f(x)-f(\frac{5}{2})}{x-\frac{5}{2}}$ (2)

(III) Does the value $f'(\frac{5}{2})$ exist? Justify your answer. (1)

Question 4 [4 mark(s)]

Use mathematical induction to prove the following proposition.

$$\sum_{i=2}^{n-1} 4^{i+1} = \frac{4}{3}(4^n-16), \quad n\geq 3$$

END OF QUESTION PAPER