UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE

DEPARTMENT OF PURE AND APPLIED MATHEMATICS

MODULE **MAFT0A1**
MATHEMATICS FOR TEACHERS

CAMPUS **APK**

EXAM **SPECIAL EXAM 2021**

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INTERNAL MODERATOR: DR T MUDZIIRI SHUMBA

DURATION: 2 HOURS **MARKS: 50**

WRITE THE FOLLOWING ON YOUR ANSWER SHEET:

SURNAME AND INITIALS

STUDENT NUMBER

NUMBER OF PAGES: 4 PAGES (including front page)

INSTRUCTIONS:

- Read all the questions carefully (from start to finish) before attempting to solve them.
- Answer all questions.
- Show all calculation and motivate all answers.
- You are NOT allowed to use a calculator in this test.
- You must download the questions yourself and are not allowed to obtain them by any other means than via Blackboard. You may not share your downloaded copy of the questions with any other student. You MUST complete and submit the version allocated to you.
- You will be allowed 3 opportunities to upload a file. Only the last file uploaded will be marked. Please make sure that you select the correct file.
- **Please submit a single pdf file in which all pages have the same orientation.**
- Absolutely no teamwork or external assistance is allowed –-- if there is any indication that your work resembles another student's work, or is not your own work, the case will be sent for analysis and a disciplinary hearing and possible expulsion may result.
- The exam is open-book, so you may consult your textbook, slides, videos etc.
- Please do not leave it until to start working on the exam. If you do, you may not have enough time to complete it. Please note that no extensions or late submissions will be granted.
- Please allow some time for uploading and submitting your solutions.
- Good luck!

Question 1 **[10]**

a. Find the equation of the inverse function of: $f(x) = e^{2x-1}$. (2)

b. Given: $h(x) = \frac{x}{2} - \frac{7}{2}$

Solve for $h(x^2 - 2) = 0$. (2)

c. Given: $f(x) = x^3 - 8$ and $g(x) = x^2 - 4$.

(i) Find $g \circ f$ and simplify your answer. (3)

(ii) Solve for x if $(gf)(x) = 0$. (3)

Question 2 **[4]**

The loudness *L*, of a sound (measured in decibel, dB) is **inversely proportional** to the square of the distance *d* from the source of the sound. A person who is 10 ft from a lawn mower experiences a sound level of 70 dB. How loud is the lawn mower when the person is 100 ft away?

Question 3 **[4]**

Use long division to find the quotient and the remainder of

$$(x^4 + 1) \div (x^2 - x - 1)$$

Indicate clearly which is the quotient and which is the remainder.

Question 4 **[7]**

a. Solve the equation by the method of completing the square:

$$2x^2 + 5x + 3 = 0$$ (3)

b. Solve for x:

(i) $2^{x^2} = 8$ (2)

(ii) $\log_2(\log_3 x) = 1$ (2)

Question 5 **[7]**

a. Point W = (5, 3). Circle J has a center at point W and radius of r = 5. This circle intersects the y-axis at one intercept and the x-axis at two intercepts. What is the area of the triangle formed by these three intercepts? Show all calculations. (4)

b. Suppose a rhombus ABCD is drawn on a coordinate plane with the point A situated at (4;7). The diagonal BD lies on the line y=2x−5.
Find the equation the line that passes through A and C. (3)

Question 6 [10]

a. Describe in words the transformations from the parent function

$$g(x) = |x| \qquad \text{to} \qquad f(x) = 1 - |x + 2|$$ (2)

b. Use transformations to sketch the graph of $y = 1 + \ln(-x)$. Clearly show:

- The x-intercept
- The asymptote
- One other point on the graph. (3)

c. Given $f(x) = \left(\frac{1}{3}\right)^x$

(i) Sketch the graph of $f(x)$, indicating the y-intercept on your sketch. (2)
(ii) Is f an increasing or decreasing function? (1)
(iii) Determine $f^{-1}(x)$ in the form $y = \cdots$ (1)
(iv) Write down the equation of the asymptote of $f(x) - 5$. (1)

Question 7 [8]

Given $f(x) = \frac{x^2-4}{x^2}$

a. Determine the x – and y -intercepts. (2)
b. Find the vertical asymptote(s). (1)
c. Find the horizontal asymptote(s). (1)
d. Complete the table in order to help you determine the position of the sketch at the given points: (1)

	$(-\infty;\ -2)$	$(-2; 0)$	$(0; 2)$	$(2;\ \infty)$

e. Sketch the graph f, indicating all intercepts and asymptotes. (3)