MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER JULY/AUGUST 2024 (TERM ID: 2420)

CMT1114 – MATHEMATICS 1

(TC1L & TC2L)

04 OCTOBER 2024
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **3** printed pages excluding the cover page.
2. Attempt **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided. All necessary working steps **MUST** be shown.
4. You are required to write proper steps to obtain maximum marks.

Question 1 [10 Marks]

a) Simplify the expression and write your final expression as a fraction with positive exponents.

$$\frac{(8x^3y^{\frac{1}{4}})^{\frac{2}{3}}}{(x^2y^{\frac{3}{4}})^{\frac{4}{5}}}$$

(2 marks)

b) Rationalize the denominator for $\frac{2+\sqrt{7}}{\sqrt{7}-2}$ and simplify. (2 marks)

c) Simplify the expression and express your final answer in a single quotient.

$$\frac{x^2+5x+6}{2x+4} \div \frac{3x+6}{x^2-4}$$

(3 marks)

d) Express the following in the form $a + bi$ where a and b are real numbers.

$$\frac{1}{2-i} + \frac{1}{1+2i}$$

(3 marks)

Question 2 [10 marks]

a) Solve the following equation using quadratic formula.

$$3x^2 = 6x - 1$$

(2 marks)

b) Solve the equation involving absolute value.

$$\frac{2|1-2x|}{3} = \frac{10}{3}$$

(2 marks)

c) Solve the following equation for x. Check the correctness of your answer. (3 marks)

$$\sqrt{2x+1} + 1 = x$$

d) Solve the rational inequality $\frac{-x-3}{x+2} < 0$ and write the answer in the interval notation.

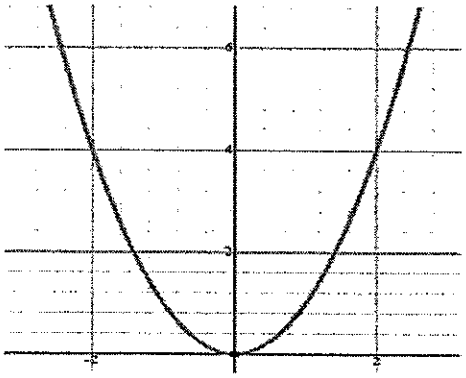
(3 marks)

Continued...

Question 3 [10 marks]

a) Given the function $f(x) = x^2$, sketch the graph of the following functions, then indicate clearly the vertex and the y-intercept of each graph.

(5 marks)



i) $f(x) = x^2 + 4$

ii) $f(x) = x^2 - 4$

iii) $f(x) = (x + 5)^2$

iv) $f(x) = (x - 5)^2$

v) $f(x) = \sqrt{x - 5}$

b) Given $f(x) = \frac{1}{x}$ and $g(x) = x - 5$, find each of the following functions

(2.5 marks)

i) $\left(\frac{f}{g}\right)(x)$

ii) The domain of $\left(\frac{f}{g}\right)$

iii) $\left(\frac{f}{g}\right)(-5)$

c) Verify that the following function is inverse of the other.

$f(x) = 4x - 7; g(x) = \frac{x+7}{4}$ (2.5 marks)

Continued...

Question 4 [10 marks]

a) Use the leading coefficient test to determine the end behaviour of the function $f(x) = x^4 - 4x^2$ (1 mark)

b) Use long division to find the quotient and the remainder when the polynomial $f(x) = 2x^5 - x^3 + 2$ is divided by $x^2 - 1$ (3 marks)

c) Solve the following logarithmic equation and check the correctness of your answer.
$log_2 x + log_2(x - 7) = 3$ (4.5 marks)

d) Given the exponential function $f(x) = 2^x$, calculate $f(x)$ for $(x = -2, -1, 0, 1, 2)$ and then plot the test points of the function $f(x)$. (1.5 marks)

Question 5 [10 marks]

a) Find the equation of the circle that has the points (-1,6) and (3,-4) as the endpoints of its diameter. (2 marks)

b) Find the equation of the locus of the point $P(x, y)$ such that its distances from the points A(-3, 6) is half the distance from the point B(7, 1). (3 marks)

c) The line $y = 2x - 8$ cuts the curve $2x^2 + y^2 - 5xy + 32 = 0$ at the points A and B. Find the length of the line AB. Show all steps. (5 marks)

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