DIPLOMA IN INFORMATION AND TECHNOLOGY PROGRAMME (DITN)
MAT1103: FUNDAMENTALS OF MATHEMATICS
FINAL EXAMINATION: JANUARY 2020 SESSION

Instruction: This paper consists of **TWO (2)** sections. Answer **ALL** questions in the answer booklet provided. All questions carry equal marks.

Section A

Question 1

(a) Simplify the expression below to the simplest form and rewrite using only positive exponents.

(i) $\left(\frac{2x^5y^{-2}}{x^{-3}y^2}\right)^4$ (3 marks)

(ii) $3\sqrt{18} + 2\sqrt{50} - \sqrt{98}$ (3 marks)

(iii) $\frac{2}{5+\sqrt{x}}$ (3 marks)

(iv) $\frac{a^2-1}{a} \times \frac{a^2}{a^2+2a+1}$ (4 marks)

(b) Solve the following inequalities.

(i) $7x - 8 < 4x + 7$ (3 marks)

(ii) $\left|\frac{x-2}{3}\right| < 3$ (4 marks)

(c) Find the equation of the line that is perpendicular to the line $5x - 2y = 3$ that passes through the point $(-2, 1)$. (5 marks)

Question 2

(a) Determine whether the lines $4x - 5y = 20$ and $5x - 4y = 40$ are parallel, perpendicular or neither. (3 marks)

(b) Let $f(x) = x - 1$ and $g(x) = 2x^2$. Find the followings:

(i) $(f + g)(2)$ (3 marks)

(ii) $(g \circ f)(2)$ (3 marks)

(c) Sketch the graph of the function $y = 5x^2 - 7x + 2$ with the x-intercept, y-intercept and vertex shown clearly. (6 marks)

(d) Solve the following equations for x.

(i) $e^{3x-1} = 5$ (Correct to 4 decimal places) (4 marks)

(ii) $\log_3 x + \log_3(x - 2) = 1$ (6 marks)

Section B

Question 3

(a) Expand the following logarithmic function.

$$\log_3 \frac{9x^4}{\sqrt{y}}$$

(5 marks)

(b) Find the solution of the following system of equations.

$$\begin{aligned} x + y + z &= 1 \\ 2x - y - z &= -4 \\ x - 2y + z &= 4 \end{aligned}$$

(6 marks)

(c) Sketch the graphical solution of the following system of inequalities.

$$\begin{aligned} x &\geq 1 \\ y + x &\geq 6 \\ y &\leq 10 - 2x \end{aligned}$$

(6 marks)

(d) Given the n^{th} term of an arithmetic progression is $3n + 4$. Find

(i) the first term, (1 marks)

(ii) the common difference, (2 marks)

(iii) the 7th term, (2 marks)

(iv) the sum of the first 7 terms. (3 marks)

Question 4

(a) The first term and fourth term of a geometric sequence are -2 and -54 respectively. Find

(i) the 7^{th} term, (5 marks)

(ii) the sum of the first 7 terms. (2 marks)

(b) Find the derivative of the following equation.

(i) $x^2 + 2xy - y^2 = 25$ (6 marks)

(ii) $y = 3x(x^3 - 1)^4$ (6 marks)

(c) Find the following integral using substitution method.

$$\int_0^1 \sqrt{x}\sqrt{x\sqrt{x}+1}\,dx$$

(6 marks)

≈ The End≈

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