

ACADEMIC YEAR 2023 - 2024

Program	Year	Semester	Paper
LTM	1	2	MAIN

MODULE NAME:	ARITHMETICS-II		
MODULE CODE:	PMATH-I-II	EXAM DATE:	23.05.2024
INSTRUCTOR's NAME:	Dr. Yaqoob Mubarak Al Rahbi	DURATION:	2 hrs.

Questions to be answered on:



Space provided on the question paper

Allowed tools:

Pen, Pencil & Calculator

Number of pages

(Incl. cover page): **12**

Points of attention:

- For each question, the maximum earned points are mentioned between brackets at the end of each question.
- Write very clearly! Answers that are not readable are not marked and don't get points!
- Make sure your answers are written to the point.
- All answers should be written **in English**.
- Write all the answers in **blue or black pen only**.
- Use the **pencil** only for **diagrams & graphs**.
- Show all the calculation steps in the given space.
- When finished submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Any cheating/copying may result in an instant failing of the examination.

FINAL MARKS

STUDENT NAME:

STUDENT ID:

	40
	10

Number of answer scripts:.....

Invigilator:.....

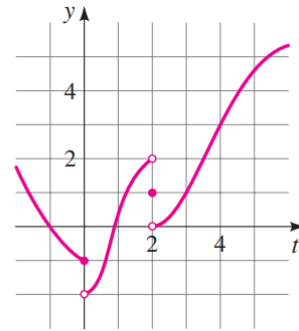
Student's signature:

Time of receipt:.....

ANSWER ALL THE QUESTIONS

1. For the function f whose graph is given, state the value of the given quantity, if it exists. If it does not exist, explain why.

- a) $\lim_{t \rightarrow 0} f(t)$
b) $\lim_{t \rightarrow 4} f(t)$



[6 Marks]

2. Use a table of values to estimate the value of the limit

[4 Marks]

$$\lim_{x \rightarrow 1} \left(\frac{x^3 - 1}{x^2 - 1} \right)$$

3. Use the definition of the derivative to find the derivative of the function
$$f(x) = x^2 - 7$$

[4 Marks]

4. Differentiate the following functions.

[6 Marks]

a) $f(x) = (4x + 1)(6x + 3)$

b) $f(x) = \frac{5x}{x-1}$

c) $f(x) = \left(\frac{2x}{x+2}\right)^4$

5. A group of biologists studied the nutritional effects on rats that were fed a diet containing 10% protein. The protein consisted of yeast and corn flour. Over a period of time, the group found that the (approximate) rate of change of the average weight gain G (in grams) of a rat with respect to the percentage P of yeast in the protein mix was **[4 Marks]**

$$\frac{dG}{dp} = -\frac{P}{25} + 2 \quad 0 \leq P \leq 100$$

. If $G = 38$ when $P = 10$, find G .

6. Find all points of discontinuity

[4 Marks]

$$f(x) = \begin{cases} \frac{5}{x(x-2)} & \text{if } x \geq -1 \\ 5x - 1 & \text{if } x < -1 \end{cases}$$

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7. Evaluate the following definite integrals:

[4 Marks]

a) $\int_1^3 5x \, dx$

b) $\int_0^1 (x^2 + x) \, dx$

8. Find an equation of the tangent line to the curve

[4 Marks]

$$f(x) = \frac{4}{x-1}$$

at the point (3,3).

9. Find the area of the region bounded by
 $y = x^2$, and $y = x$

[4 Marks]

Draft Paper

Formula Sheet

- 1) $m = slope = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$
- 2) $m = slope = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$
- 3) Definition of Derivative: $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$
- 4) Instantaneous Velocity: $v = \lim_{h \rightarrow 0} \frac{s(t+h) - s(t)}{h}$
- 5) $\lim_{x \rightarrow \infty} \frac{1}{x^k} = 0$
- 6) $\lim_{x \rightarrow -\infty} \frac{1}{x^k} = 0$
- 7) $y - y_1 = m(x - x_1)$
- 8) $y - y_1 = \frac{-1}{m}(x - x_1)$
- 9) $\frac{d}{dx}(c) = 0$
- 10) $\frac{d}{dx}(x^a) = ax^{a-1}$
- 11) $\frac{d}{dx}(cf(x)) = c \frac{d}{dx}(f(x)) = cf'(x)$
- 12) $\frac{d}{dx}(f \cdot g) = f \cdot g' + g \cdot f'$
- 13) $\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{g \cdot f' - f \cdot g'}{(g)^2}$
- 14) $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$
- 15) $\frac{d}{dx}(u^a) = au^{a-1} \frac{du}{dx}$