



# UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, MAY 2018

COURSE NO.: MA 276

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COURSE NAME: NUMERICAL METHODS AND SCIENTIFIC COMP.

CLASS: MA II

TIME: 2 HOURS

Name: \_\_\_\_\_

Index Number: \_\_\_\_\_

## Answer ALL Questions

1. Write the algorithm and draw a flow chart for a computer program that would:
- read an employee name (NAME), overtime hours worked (OVERTIME) hours absent (ABSENT), and
  - Determine the bonus payment (PAYMENT) for,

Bonus Schedule	
OVERTIME – (2/3)*ABSENT	BONUS PAID
>40 hours	\$50
>30 but ≤ 40 hours	\$40
>20 but ≤ 30 hours	\$30
>10 but ≤ 20 hours	\$20
≤ 10 hours	\$10

2. a) Use **diff** command to differentiate the following
- $x e^{-x^2}$
  - $\frac{\sqrt{x^3 - 5} - \sin(2x)}{x^5 + 3}$
- b) Perform a three (3) dimensional plot of  $f(x) = \sin(x) * \sin(y)$  from  $x = -\pi$  to  $\pi$  and  $y = -\pi$  to  $\pi$ .
- c) Use maple procedure to define the following function.

$$P(x) = \begin{cases} x^3 + 3 & \text{if } -5 \leq x \leq 5 \\ 2x + 1 & \text{if } x > 5 \\ 1 & \text{if } x < -5 \end{cases}$$

3. a) Perform an implicit plot of the function  $\left(x - \frac{\pi}{2}\right)^2 + y^2 = 1$  on the square

$x = -\pi..2$  and  $y = -2..2$ . On the same graph, draw the graph of  $\sin(x)$  in blue from  $x = -\pi..2$

b) Consider the system of equations

$$x_1 + x_2 - 2x_3 + x_4 + 3x_5 - x_6 = 4$$

$$2x_1 - x_2 + x_3 + 2x_4 + x_5 - 3x_6 = 20$$

$$x_1 + 3x_2 - 3x_3 - x_4 + 2x_5 + x_6 = -15$$

$$5x_1 + 2x_2 - x_3 - x_4 + 2x_5 - x_6 = -3$$

$$-3x_1 - x_2 + 2x_3 + 3x_4 + x_5 + 3x_6 = 16$$

$$4x_1 + 3x_2 + x_3 - 6x_4 - 3x_5 - 2x_6 = -27$$

Solve the system  $Ax = b$  of equations above in the following ways:

- i) Augment and use Reduced Row Echelon Form
- ii) Linear Solve

*Examiner: E. Danso-Addo*