Major Assessment 2

| RUIZ, REINARD | O2A | MA2 | Score _____ | Total Pnts 25

Direction: Answer correctly the following problems, write your answer on Canvass

Problem 1: Transform the first column to 1, 0, 0 of the following matrix system of equation using Gauss Jordan Elimination algorithm I discussed. Write your answer which specify the rows and column of coefficient or constant matrix. Example: coefficient matrix (r,c) = answer ; constant matrix (r,1)= answer

Answer in Problem 1 (2pts):

$$\begin{bmatrix} u & b & z \\ a & e & i \\ n & r & d \end{bmatrix} \begin{bmatrix} A \\ B \\ C \end{bmatrix} = \begin{bmatrix} g \\ f \\ c \end{bmatrix}$$

$$\begin{bmatrix} \underline{\ 1\ } & \underline{\ \ \ } & \underline{\ \ \ } \\ \underline{\ 0\ } & \underline{\ \ \ } & \underline{\ \ \ } \\ \underline{\ 0\ } & \underline{\ \ \ } & \underline{\ \ \ } \end{bmatrix} \begin{bmatrix} A \\ B \\ C \end{bmatrix} = \begin{bmatrix} \underline{\ \ \ } \\ \underline{\ \ \ } \\ \underline{\ \ \ } \end{bmatrix}$$

Problem 2: Given with the following x and y data and a function $y = ax^2 + bx + c$ where a, b and c are unknown constants. Find the function that gives the least square error using the given data?

Answer in Problem 2 (4pts):

x	13.7	14.7	18.7	22.7
y	36.7	28.7	36.7	21.7

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Problem 3: Given with the following x and y data, what is the lagrange polynomial correspond to data at x = 18.0 and y = 41.0.

Answer in Problem 3 (3pts): $l_1 y_1$

	1	2	3	4
x data	18.0	19.0	23.0	27.0
y data	41.0	33.0	41.0	26.0

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Problem 4: Given with the following x and y data, can produce a second degree polynomial $y = ax^2 + bx + c$ using direct method interpolation.
4a. Create a linear system of equation and transform to matrix system of equation? Write your answer which specify the rows and column of coefficient or constant matrix. Example: coefficient matrix (r,c) = answer ; constant matrix (r,1)= answer
4b. What is the resulting polynomial?

Answer in Problem 4a (2pts):

x	11.1	11.5	12.0
y	11.5	17.5	23.5

$$\begin{bmatrix} \underline{\ \ \ } & \underline{\ \ \ } & \underline{\ \ \ } \\ \underline{\ \ \ } & \underline{\ \ \ } & \underline{\ \ \ } \\ \underline{\ \ \ } & \underline{\ \ \ } & \underline{\ \ \ } \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} \underline{\ \ \ } \\ \underline{\ \ \ } \end{bmatrix}$$

Answer in Problem 4b(1pts):

_____

Problem 5: Given with the following x and y data shown at the left side and the table at the right side is the Newton's Divided Difference(NDD) constant table.
5a. Find the value of A, B, C, and D in NDD constant table?
5b. What is the resulting Newton's Divided Difference polynomial using all the given data points?
5c. Interpolate x = 13.75 ?

Given Data:

x	10.0	11.0	12.0	15.5
y	10.5	13.134	15.3	19.9

NDD Constant Table:

y	$1st$	$2nd$	$3rd$
10.5			
A	2.634		
15.3	B	-0.234	
19.9	1.31429	C	D

Answer 5a (0.5pts each): A = _____ , B = _____ , C = _____ , D = _____ Answer 5c (1pt): y = _____

Answer 5b (3pts): _____

Problem 6: The following data is the distance and time travelled of a rocket, find the velocity of the rocket at t = 75 seconds. Use the centered finite difference with $E(h^4)$.

Given Data:

Time (seconds)	25.0	50.0	75.0	100.0	125.0
Position (meter)	32.0	58.0	78.0	92.0	100.0

Answer 6 (2pts): Velocity = _____

Problem 7 (Fill in the blanks): In interpolation, a _____ number of data set or pair can create a 5th degree of polynomials.

Problem 8 (Questions): What method of interpolation has the following formula? (1pnt)

$$p(x) = \sum_{i=1}^{n} y_i \cdot \prod_{j=i, j \neq i}^{n} \frac{(x - x_i)}{(x_i - x_j)}$$

Problem 9 (Question): What numerical methods for solving linear system of equations, has elimination and backwards substitution, where elimination is define as changing the under diagonal elements of coefficient matrix to a value of zero and backward substitution is to solved the final solution after the elimination. (1pnt)

Problem 10 (Question): What numerical methods for solving linear system of equations, where the coefficient matrix of a given matrix system of equation must transform or converted to identity matrix to find the final solution? (1pnt)

Problem 11 (Question): What curve fitting method has the formula of $A^T Av = A^T b$, [where: A^T- transposed coefficient matrix; A - coefficient matrix; v - unknown vector or variable; b - constant matrix] to find least square solution? (1pnt)

Problem 12 (Question): What interpolation method I've discussed where a series are added from constant to higher order polynomial terms? (1pnt)

Problem 13 (Question): What are the the 3 ways to improve derivative estimates in numerical differentiation? (2pnt)