Info 3

Introduction to MATLAB

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Exam

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Commands (3 pts)

Write the right MATLAB commands to calculate the following expressions:

1. $E_1 = \frac{-b-\sqrt{b^2-4ac}}{2a}$
2. $E_2 = \frac{b+e^{a+2}}{b-1}$
3. $E_3 = \sqrt{|\alpha - 3|} + \frac{\sin\beta+1}{e^{\alpha}+\sqrt{a-1}}$

Input and Output functions (3 pts)

Give the output of the following commands using MATLAB Command window.

```
>> n = input('Please enter a value:');
>> disp('Please enter your last name:')
>> D = 10; disp(sqrt(D-1) - 1)
>> D = 'Student'; disp('I am a %s', D)
>> a = 1; fprintf('Product of %d , %.2f and  %f is  %.3f\n', a , a, 1, a*a)
>> A = 5.12345; B = 5; fprintf('A - B = %.3f - %.2f = %.1f \n', A, B, A-B)
```

Matrix construction (5pts)

1. Given the matrix P, provide the execution of these commands:

$$p = \begin{pmatrix} 2 & 0 & 1 \\ 9 & 3 & 6 \\ 5 & 4 & 7 \end{pmatrix}$$

```
>> P(2,2)
>> P(2,:)
>> P1 = P(:,end)
>> P2 = P(1:3, 2:3)
>> size(P+1)
>> numel(P)
```

2. Write a code to construct a 3-by-5 matrix A where:

$$A(i,j) = \begin{cases} i - j^3 & i \neq j \\ i^3 - j & i = j \end{cases}$$

3. Give the corresponding command to extract and display:

   (a) The last column of the matrix A.

   (b) The matrix containing the elements indicated by x in the following matrix.

$$\begin{bmatrix} X & X & X & X & X \\ X & X & x & x & x \\ X & X & x & x & x \end{bmatrix}$$

   (c) Replace the x elements with their squares.

Functions (3 pts)

1. Write a function to calculate the surface area of a rectangular prism given by:

$$S = 2(hw + lh + wh)$$

   where: w is the base width, l is the base length and h represents the height.

2. Give the corresponding command to calculate the surface area of a rectangular prism with: $w = 2$, $h = 1$ and $l = 0.5$

Plots (2 pts)

Write the commands window to plot the functions f1 and f2 in the interval [-1, 10] arranged by the step 0.5 in the same graph where:

$$f_1(x) = x^2 - 1, f_2(x) = x + 1$$

Application (4pts)

A factory recorded the electricity consumption (in Kw) for three different machines over 5 days. The data are stored in the matrix *Elt* as follows.

$$Elt = \begin{bmatrix} 48 & 55 & 60 & 45 & 50 \\ 80 & 75 & 85 & 90 & 70 \\ 32 & 40 & 25 & 35 & 30 \end{bmatrix}$$

1. Write commands to compute and display:

   (a) The average consumption of each machine.

   (b) The highest consumption of each day.

   (c) The day having the highest total consumption and the value of that consumption.

2. Give the command(s) that change (swap)the data of the first machine with the third machine.