

### QUESTION 1

For the below system, find all solutions or demonstrate that no solution exists.

$$5x - 3y + z = 7$$

$$2x + 3y - z = 0$$

$$8x + 9y - 3z = 2$$

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### QUESTION 2

Find the eigenvalues of  $A$ , and find a basis for each eigenspace.

$$A = \begin{bmatrix} 0.5 & -0.6 \\ 0.75 & 1.1 \end{bmatrix}$$

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### QUESTION 3

Show whether or not a real  $3 \times 3$  matrix  $A$  with eigenvalues  $-0.5$ ,  $0.2+0.3i$ , and  $0.2-0.3i$ , and the following corresponding eigenvectors is diagonalizable.

$$v_1 = \begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix} \quad v_2 = \begin{bmatrix} 1+2i \\ 4i \\ 2 \end{bmatrix} \quad v_3 = \begin{bmatrix} 1-2i \\ -4i \\ 2 \end{bmatrix}$$

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### QUESTION 4

Find a parametric representation of a straight line that passes through the points  $(1, 1, 1)$  and  $(12, 4, 26)$ .

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### QUESTION 5

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### QUESTION 5

Evaluate  $\int_C (x+2) \, ds$  where  $C$  is the curve represented by

$$\mathbf{r}(t) = t\mathbf{i} + \frac{4}{3}t^{3/2}\mathbf{j} + \frac{1}{2}t^2\mathbf{k}, \quad 0 \leq t \leq 2.$$

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### QUESTION 6

Find the square roots of  $1 - \sqrt{3}i$  expressed in rectangular coordinates.

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### QUESTION 7

Evaluate the following integral where  $C$  is the semicircle  $z = 2e^{i\theta}$ ,  $(0 \leq \theta \leq \pi)$ .

$$\oint_C \frac{z+2}{z} dz$$

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### QUESTION 8

Find the Laurent series that represents the following function in the domain  $0 \leq |z| \leq \infty$ .

$$f(z) = z^2 \sin\left(\frac{1}{z^2}\right)$$

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### QUESTION 9

Construct and analytic function whose real part is  $U(x,y) = x^3 - 3xy^2 + y$ .

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### QUESTION 10

Evaluate

$$\int_{-\infty}^{\infty} \frac{dx}{1+4x^4}$$

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