MATLAB Tutorial 08

ENME 303 Computational Methods for Engineers

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Practice 01

- Consider the following system of linear equations.

$$\begin{cases} 2x + 3y = 5 \\ 2x + 4y = 6 \end{cases}$$

1. Write this system of equations in the $Ax = b$ form. Provide A and b.
2. Find the reduced row Echelon form of A using rref function.
3. Find the rank of A using rank function.
4. Find a basis for $\mathcal{R}(A)$ using orth function. What's the dimension of $\mathcal{R}(A)$?
5. Find a basis for $\mathcal{N}(A)$ using null function. What's the dimension of $\mathcal{N}(A)$?
6. Plot each column of A and b using MATLAB's quiver function.
7. Geometrically, does it look like a solution to the equation $Ax = b$ exists?
8. Define $x_s \triangleq inv(A) \times b$ and $y \triangleq A \times x_s$. Plot y using the quiver function. Does the y vector match the b vector?

Practice 02

- Consider the following system of linear equations.

$$\begin{cases} 9x + 5y + 8z = 3 \\ 7x + 8y + 5z = 8 \\ 9x + 4y + 0z = 4 \end{cases}$$

1. Write this system of equations in the $Ax = b$ form. Provide A and b.
2. Find the reduced row Echelon form of A using rref function.
3. Find the rank of A using rank function.
4. Find a basis for $\mathcal{R}(A)$ using orth function. What's the dimension of $\mathcal{R}(A)$?
5. Find a basis for $\mathcal{N}(A)$ using null function. What's the dimension of $\mathcal{N}(A)$?
6. Plot each column of A and b using MATLAB's quiver3 function.
7. Geometrically, does it look like a solution to the equation $Ax = b$ exists?
8. Define $x_s \triangleq inv(A) \times b$ and $y \triangleq A \times x_s$. Plot y using the quiver function. Does the y vector match the b vector?

Practice 03

- Consider the following system of linear equations.

$$\begin{cases} 9x + 5y + 24z = 3 \\ 7x + 8y + 31z = 8 \\ 9x + 4y + 21z = 4 \end{cases}$$

1. Write this system of equations in the $Ax = b$ form. Provide A and b.
2. Find the reduced row Echelon form of A using rref function.
3. Find the rank of A using rank function.
4. Find a basis for $\mathcal{R}(A)$ using orth function. What's the dimension of $\mathcal{R}(A)$?
5. Find a basis for $\mathcal{N}(A)$ using null function. What's the dimension of $\mathcal{N}(A)$?
6. Plot each column of A and b using MATLAB's quiver3 function.
7. Geometrically, does it look like a solution to the equation $Ax = b$ exists?
8. Define $x_s \triangleq pinv(A) \times b$ and $y \triangleq A \times x_s$. Plot y using the quiver function. Does the y vector match the b vector?

Practice 04

- Consider the following system of linear equations.

$$\begin{cases} 9x + 5y + 24z = 21.0 \\ 7x + 8y + 31z = 26.2 \\ 9x + 4y + 21z = 18.6 \end{cases}$$

1. Write this system of equations in the $Ax = b$ form. Provide A and b.
2. Find the reduced row Echelon form of A using rref function.
3. Find the rank of A using rank function.
4. Find a basis for $\mathcal{R}(A)$ using orth function. What's the dimension of $\mathcal{R}(A)$?
5. Find a basis for $\mathcal{N}(A)$ using null function. What's the dimension of $\mathcal{N}(A)$?
6. Plot each column of A and b using MATLAB's quiver3 function.
7. Geometrically, does it look like a solution to the equation $Ax = b$ exists?
8. Define $x_s \triangleq pinv(A) \times b$ and $y \triangleq A \times x_s$. Plot y using the quiver function. Does the y vector match the b vector?

Thanks!