**MTH501 Assignment #2 Fall 2023**

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**Question:**

Show that 5 is an eigenvalue of 𝐴=, find the corresponding eigenvectors.

**Solution:**

The scalar 5 is an eigenvalue of A if the equation Ax = 5x has a non-trivial solution. But (A) is equivalent to

**Ax-5x=0**

or

we can simply write

**(A-5I) x = 0**

Now, we have to solve this homogeneous equation.

A-5I = 

= 

= 

The determinant of the above matrix is zero. That’s mean the columns of A-5I are linearly dependent. So, the given equation (A-5I) x = 0 has a non-trivial solution.

Now, we need to find the eigenvectors of that equation

(A-5I) x = 0

Let us consider x = 

Now put the both the values in the (A-5I) x = 0 equation.



We need to make an Augmented Matrix now.



We have to convert this matrix into Echelon Form.

R2 + R1



Now simply convert this into equation form.

-2x1 + 4x2 = 0

2x1 = 4x2

x1 = 2x2

Let x2 = 2, because x2 is free variable.

So, x1 = 4 and x2 = 2

x = is the eigenvectors of eigenvalue of 5.

**Question 2:**

Determine whether the signals, 2k ,4k, 𝑎𝑛𝑑 (−3)k are linearly independent or not.

**Solution:**

According to the condition of question, first we need to make a casorati matrix of the given values.



Now, put the value of k = 1.



Applying row operation to convert matrix into row reduce

R3 - 4R1



R2 – 2R1



R3 – 6R2



The above casorati matrix is invertible for k = 1.

So, 2k, 4k, and (-3)k are linearly independent.