Self test number 1 – SPECIMEN

Task 1

The following vectors are given.
Determine whether these vectors can be basis or generators of a vector space and determine the dimension of this space.

$v1 = (-27, -24, -9, -21, 6)$
$v2 = (7, 5, 1, 5, 2)$
$v3 = (-4, -6, -4, -4, 8)$

Question 1
What do you know about the linear dependence of these vectors?

- ○ These vectors are linearly independent
- ● These vectors are linearly dependent

Question 2
Can these vectors be generators?

- ○ These vectors can be vector space generators with dimension 5
- ○ These vectors can be vector space generators with dimension 4
- ○ These vectors can be vector space generators with dimension 3
- ● These vectors can be vector space generators with dimension 2
- ○ These vectors cannot be vector space generators

Question 3
Can these vectors be basis?

- ○ These vectors can form a basis of a vector space of dimension 5
- ○ These vectors can form a basis of a vector space of dimension 4
- ○ These vectors can form a basis of a vector space of dimension 3
- ○ These vectors can form a basis of a vector space of dimension 2
- ● These vectors cannot form a basis of a vector space

Task 2

Multiply the folowing matrices A * B

$$A = \begin{pmatrix} -11 & -18 & 10 \\ -19 & 9 & 19 \\ 1 & 6 & 15 \\ 11 & -10 & -20 \end{pmatrix} \qquad B = \begin{pmatrix} 11 & 4 & -5 & -8 \\ -17 & -20 & 6 & -13 \\ -2 & -10 & -16 & 12 \end{pmatrix}$$

The element of the resulting matrix C= A*B in row 3 and column 1 is a (scalar) product of numbers or vectors - input these vectors' element values below into the suitable answer structur

(If some answer structures from below do not correspond with the required operation, fill them with zeros.)

- (0) • (0)
- (1 | 6 | 15) • (11 | -17 | -2)
- (0 | 0 | 0 | 0) • (0 | 0 | 0 | 0)

Value of the element C_{31} is −121

The resulting matrix has dimension 4 * 4

Task 3

A system of linear equations is given

$$\begin{aligned} -7x_1 + 21x_2 - 7x_3 + 28x_4 &= -217 \\ 40x_1 + 15x_2 + 5x_3 + 5x_4 &= -135 \\ 6x_1 - 1x_2 + 2x_3 + 2x_4 &= -76 \\ 24x_1 + 4x_2 + 8x_3 + 4x_4 &= -192 \end{aligned}$$

Solve it using the Jordanians method of elimination.

Question 1

How many solutions does this system of linear equations have?

- ○ No solution
- ● One solution
- ○ Infinitely many solutions

Question 2

How many variables are basic?

In this case, there are [4] basic variables.

Question 3

How many variables are non-basic?

In this case, there are [0] non-basic variables.

Question 4

Find the basic solution of the given system?

If it does not exist, write 0

X1 = [-2], X2 = [6], X3 = [-13], X4 = [-16]

Question 5

Find another basic solution for the given system?

If it does not exist, write 0

X1 = [0], X2 = [0], X3 = [0], X4 = [0]

Question 6

Can we require the X4 variable to be equal to 22 in the solution?

- ○ Yes
- ● No

Question 7

What is the solution to the system of equations in such a case?

If it does not exist, write 0

X1 = [0], X2 = [0], X3 = [0], X4 = [0]

Task 4

Given a matrix A and a vector w

$$A = \begin{pmatrix} -15 & 40 & 20 \\ 2 & -8 & -4 \\ 4 & 4 & -8 \end{pmatrix} \qquad w = (100, -32, -44)$$

Find the vector v for which
A*v=w

Instructions: use the inverse matrix and its property Ainv*A = E

Question 1
Find the vector **v**?
If it does not exist, write 0

v = (12 , 1 , 12)

Task 5

Compute the inverse of the following matrix A

$$\begin{pmatrix} 0 & 10 & -14 \\ 8 & 8 & 4 \\ 10 & -15 & 5 \end{pmatrix}$$

Show the step-by-step calculation steps
Attention - Do not change the order of rows and columns when calculating.

After the first step of the calculation, you will get a matrix
(If it cannot be counted, enter 0)

1	9/4	-5/4	1/8	1/8	0
0	-10	14	-1	0	0
0	-75/2	35/2	-5/4	-5/4	1

FRACTION WRITE AS DECIMAL NUMBERS!

After the second step of the calculation, you will get a matrix
(If it cannot be counted, enter 0)

1	0	19/10	-1/10	1/8	0
0	1	-7/5	1/10	0	0
0	0	-35	5/2	-5/4	1

The inverse matrix is
(If it cannot be counted, enter 0)

1/28	2/35	19/350
0	1/20	-1/25
-1/14	1/28	-1/35

The determinant of the matrix A is equal to 2800.

Since the determinant of the matrix A is ↑ **, this matrix is** ↑ **and** has **is the inverse matrix.**

non-null regular