Operations with vectors =

1- $[2,7]+[3,1]=$

2- $2[-2,5]+6[2,-8]=$

3- $2\vec{u}+3\vec{v}\rightarrow \vec{u}=[2,-3],\vec{v}=[-1,2]$

4-$[1,-2,4]+[6,-1,1]=$

5- $-2[0,-2,1]+3[1,-1,0]=$

6- $[2,7]-[3,1]=$

7- $3[2,7]-2[3,5]=$

8- $5\vec{u}-8\vec{v}\rightarrow u=[3,0],v=[2,-5]$

9-$[2,-7,3]-[0,4,-1]=$

10-$3u-\frac{1}{2}v\rightarrow u=[a,2b,3c]\,,v=[-4a,b,-2c]\rightarrow$

ضرب داخلی دو بردار (dot product) =

1-$[3,-2].[4,5]=$

2- $\vec{u}.\vec{v}\rightarrow u=2i+j\,,v=5i-6j$

3- $[2,0].[1,1]=$

4-$[3,4].[-2,-1]=$

5-$[2,5,0].\left[\frac{1}{2},-1,10\right]=$

6-$(2\mathrm{i}-3\mathrm{j}-\mathrm{k}).(-\mathrm{i}+2\mathrm{j}+8\mathrm{k})=$

7-$\vec{u}.\vec{v}\rightarrow u=6i-4j-2k\,,v=\frac{5}{6}i+\frac{3}{2}j-k\rightarrow$

8-$[-1,2,3].[6,5,-1]=$

پیدا کردن زاویه بین دو بردار =

1- find the angle between the vectors $\mathrm{u}=[2,5]$ and $\mathrm{v}=[4,-3]$:

2- find the angle between the vectors $u=[2,7]\ and\ v=[3,1]$:

3- find the angle between the vectors $u = [0, -5]\ and\ v = \left[-1, -\sqrt{3}\right]$:

4- find the angle between the vectors $u = i + 3j\ and\ v = 4i - j$:

5- find the angle between the vectors u=[2, −2, −1]and v=[1,2,2]:

6- find the angle between the vectors $u = j + k$, $v = i + 2j - 3k$:

ضرب خارجی دو بردار(cross product)=

$$det\begin{bmatrix} i & j & k \\ a1 & a2 & a3 \\ b1 & b2 & b3 \end{bmatrix} = i.det\begin{bmatrix} a2 & a3 \\ b2 & b3 \end{bmatrix} - j.det\begin{bmatrix} a1 & a3 \\ b1 & b3 \end{bmatrix} + k.det\begin{bmatrix} a1 & a2 \\ b1 & b2 \end{bmatrix} =$$

$$(a2b3 - a3b2)i - (a1b3 - a3b1)j + (a1b2 - a2b1)k$$

$$u \times v = [a2b3 - a3b2, a3b1 - a1b3, a1b2 - a2b1]$$

1-$[0, -1,3] \times [2,0, -1] \rightarrow$

2-$[1,0, -3] \times [2,3,0] \rightarrow$

3-$[6, -2,8] \times [-9,3, -12] \rightarrow$

4- $u \times v \rightarrow u = i + j + k\ , v = 3i - 4k \rightarrow$

5-$[2, -3,1] \times [4, -1,5] \rightarrow$

6-$[1,3,4] \times [2,7, -5] \rightarrow$

7-$u \times v \rightarrow u = [2, -3,1], v = [-2,1,1] \rightarrow$

حل سیستم معادله با ماتریس و روش گاوسی :

1- $\begin{cases} x - y + 3z = 4 \\ x + 2y - 2z = 10 \\ 3x - y + 5z = 14 \end{cases}$

2- $\begin{cases} x + y + z = 2 \\ 2x - 3y + 2z = 4 \\ 4x + y - 3z = 1 \end{cases}$

3- $\begin{cases} x - 2y + z = 1 \\ y + 2z = 5 \\ x + y + 3z = 8 \end{cases}$

4- $\begin{cases} 2x + y - 2z = 12 \\ -x - \frac{1}{2}y + z = -6 \\ 3x + \frac{3}{2}y - 3z = 18 \end{cases} \rightarrow$

5- $\begin{cases} x + 4y - 2z = -3 \\ 2x - y + 5z = 12 \\ 8x + 5y + 11z = 30 \end{cases} \rightarrow$

6- $\begin{cases} 2x - 3y - 9z = -5 \\ x + 3z = 2 \\ -3x + y - 4z = -3 \end{cases} \rightarrow$

7- $\begin{cases} x+y+z=2 \\ y-3z=1 \\ 2x+y+5z=0 \end{cases}$

8- $\begin{cases} x-y+3z=3 \\ 4x-8y+32z=24 \\ 2x-3y+11z=4 \end{cases}$

9- $\begin{cases} x-3y+2z=12 \\ 2x-5y+5z=14 \\ x-2y+3z=20 \end{cases}$

Gauss Jordan elimination: (using reduced row-echelon form)

1- $\begin{cases} 4x+8y-4z=4 \\ 3x+8y+5z=-11 \\ -2x+y+12z=-17 \end{cases}$

2 − $\begin{cases} x+y+z=5 \\ 2x+3y+5z=8 \rightarrow \\ 4x+5z=2 \end{cases}$

3- $\begin{cases} 3x-y+z=-4 \\ x+y+z=2 \rightarrow \\ 2x+3y+4z=8 \end{cases}$

Matrix operations:

1- $\begin{bmatrix} 2 & -3 \\ 0 & 5 \\ 7 & -5 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ -3 & 1 \\ 2 & 2 \end{bmatrix} =$

2- $\begin{bmatrix} 7 & -3 & 0 \\ 0 & 1 & 5 \end{bmatrix} - \begin{bmatrix} 6 & 0 & -6 \\ 8 & 1 & 9 \end{bmatrix} =$

3- $\begin{bmatrix} 2 & 6 \\ -5 & 3 \end{bmatrix} + \begin{bmatrix} -1 & -3 \\ 6 & 2 \end{bmatrix} =$

4- $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix} - \begin{bmatrix} 2 & 1 & -1 \\ 1 & 3 & -2 \end{bmatrix} =$

5- $3\begin{bmatrix} 1 & 2 \\ 4 & -1 \\ 1 & 0 \end{bmatrix} =$

6- $2\begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix} + 3\begin{bmatrix} 1 & 1 & 0 \\ 2 & 1 & 5 \\ 3 & 1 & -2 \end{bmatrix} =$

7- $\begin{bmatrix} 1 & 3 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} -1 & 5 & 2 \\ 0 & 4 & 7 \end{bmatrix} =$

8- $\begin{bmatrix} 5 & 7 \\ -3 & 0 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 9 & -1 \end{bmatrix} =$

9- $\begin{bmatrix} 1 & 2 \\ 9 & -1 \end{bmatrix} \begin{bmatrix} 5 & 7 \\ -3 & 0 \end{bmatrix} =$

10- $\begin{bmatrix} 2 & 6 \\ 1 & 3 \\ 2 & 6 \end{bmatrix} \begin{bmatrix} 5 \\ -2 \end{bmatrix} =$

11- $\begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix} \begin{bmatrix} 1 & -2 & 3 \\ 2 & 2 & -1 \end{bmatrix} =$

12- $\begin{bmatrix} 2 & -3 \\ 0 & 1 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 5 \\ 1 \end{bmatrix} =$

13- $5\begin{bmatrix} 2 & -5 \\ 0 & 7 \end{bmatrix} =$

14- $\begin{bmatrix} 2 & -5 \\ 0 & 7 \end{bmatrix} \begin{bmatrix} 3 & 0.5 & 5 \\ 1 & -1 & 3 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix} =$

15- $5\begin{bmatrix} 2 & -1 & 8 \\ -2 & 3 & 1 \end{bmatrix} . 2\begin{bmatrix} 4 \\ -2 \\ 3 \end{bmatrix} =$

Determinant of matrices =

1- $\det\begin{pmatrix} 6 & -3 \\ 2 & 3 \end{pmatrix} =$

2-$\det\begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix} =$

3-$\det\begin{pmatrix} \frac{3}{2} & 1 \\ -1 & -\frac{2}{3} \end{pmatrix} =$

4-$\det\begin{pmatrix} 4 & 5 \\ 0 & -1 \end{pmatrix} =$

5-$\det\begin{pmatrix} 2 & 3 & -1 \\ 0 & 2 & 4 \\ -2 & 5 & 6 \end{pmatrix} =$

6-$\det\begin{pmatrix} 2 & 1 & 0 \\ 0 & -2 & 4 \\ 0 & 1 & -3 \end{pmatrix} =$

7-$\det\begin{pmatrix} 30 & 0 & 20 \\ 0 & -10 & -20 \\ 40 & 0 & 10 \end{pmatrix} =$

8-$\det\begin{pmatrix} 1 & 3 & 7 \\ 2 & 0 & 8 \\ 0 & 2 & 2 \end{pmatrix} =$

Finding the inverse of a matrix =

$$for\ a\ 2 \times 2\ matrix \rightarrow \begin{bmatrix} a & b \\ c & d \end{bmatrix}^{-1} = \frac{1}{ad - bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

1- $A = \begin{bmatrix} 4 & 5 \\ 2 & 3 \end{bmatrix} \rightarrow find\ A^{-1}$:

2- $A = \begin{bmatrix} -3 & -5 \\ 2 & 3 \end{bmatrix} \rightarrow find\ A^{-1}$:

3- $A = \begin{bmatrix} 2 & 5 \\ -5 & -13 \end{bmatrix} \rightarrow find\ A^{-1}$

4-$A = \begin{bmatrix} 6 & -3 \\ -8 & 4 \end{bmatrix} \rightarrow find\ A^{-1}$

5- $A = \begin{bmatrix} 0.4 & -1.2 \\ 0.3 & 0.6 \end{bmatrix} \rightarrow find\ A^{-1}$

Eigenvalues and eigenvectors =

1- find eigenvalues and eigenvectors of $\begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$:

2- find eigenvalues and eigenvectors of $\begin{bmatrix} 8 & -2 \\ -3 & 3 \end{bmatrix}$:

3- find eigenvalues and eigenvectors of $\begin{bmatrix} 3 & 0 \\ 7 & 2 \end{bmatrix}$:

4- find eigenvalues and eigenvectors of $\begin{bmatrix} 0 & 2 \\ 2 & 3 \end{bmatrix}$:

5- find eigenvalues and eigenvectors of $\begin{bmatrix} -2 & 1 \\ -8 & 2 \end{bmatrix} =$

6- find eigenvalues and eigenvectors of $\begin{bmatrix} -8 & 4 \\ -5 & 0 \end{bmatrix} =$

7- find eigenvalues and eigenvectors of $\begin{bmatrix} 2 & 1 \\ -5 & 4 \end{bmatrix} =$