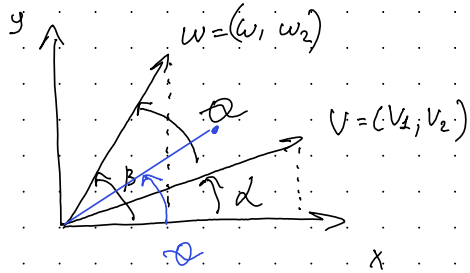
PS 1.2

23

$$\cos\beta = \frac{w_1}{\|w\|} \qquad \sin\beta = \frac{w_2}{\|w\|}$$

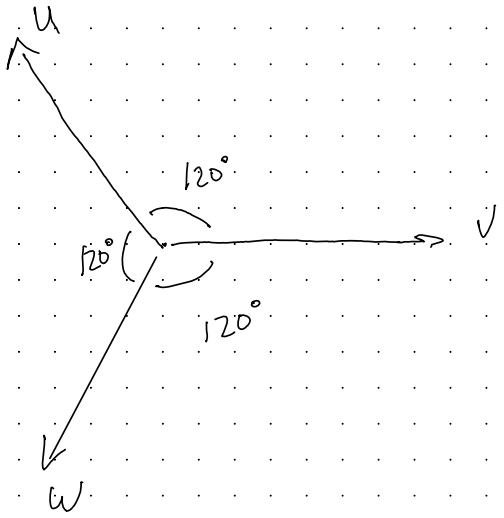


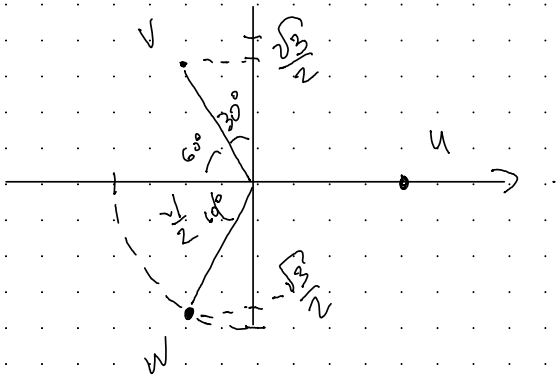
$$\cos(\beta - \alpha) = \cos\beta\cos\alpha + \sin\beta\sin\alpha =$$

$$= \frac{w_1}{|w|}\cdot\frac{v_1}{|v|} + \frac{w_2}{|w|}\cdot\frac{v_2}{|v|} =$$

$$= \frac{w_1 v_1 + w_2 v_2}{|w|\cdot|v|} = \frac{w\cdot v}{|w|\cdot|v|} = \cos(\theta)$$

28 xy plane


U
V
W
120°
120°
120°


V
U
W
√3/2
-√3/2
1/2
-1/2
30°
60°

PS 1.3

4

$$w_1 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \qquad w_2 = \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix} \qquad w_3 = \begin{bmatrix} 7 \\ 8 \\ 9 \end{bmatrix}$$

Find 1. combination that gives zero vector

$$x_1 w_1 + x_2 w_2 + x_3 w_3 = 0$$

$$\begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = 0 \qquad \begin{matrix} x_1 + 4x_2 + 7x_3 \\ 2x_1 + 5x_2 + 8x_3 = 0 \\ 3x_1 + 6x_2 + 9x_3 \end{matrix}$$

$$\begin{matrix} 1 & 4 & 7 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{matrix} \qquad \begin{matrix} x_1 \\ x_2 - x_1 \\ x_3 - x_2 \end{matrix}$$

$$\begin{bmatrix} 1 & 4 & 7 \\ 1 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 - x_1 \\ x_3 - 2x_2 + x_1 \end{bmatrix}$$

dependent

$$\begin{matrix} 1 & 3 & 7 \\ 2 & 3 & 8 \\ 3 & 3 & 9 \end{matrix}$$

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PS 2.1

29

$$u_1 = Au_0 = \begin{bmatrix} .8 & .3 \\ .2 & .7 \end{bmatrix}\begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} .8 \\ .2 \end{bmatrix}$$

$$u_2 = Au_1 = \begin{bmatrix} .8^2 + .06 \\ .16 + .14 \end{bmatrix} = \begin{bmatrix} .7 \\ .3 \end{bmatrix}$$

$$u_3 = \begin{bmatrix} .56 + .09 \\ .14 + .21 \end{bmatrix} = \begin{bmatrix} .65 \\ .35 \end{bmatrix}$$

30

$$\begin{matrix} 0.6 \\ 0.39 \end{matrix}$$

$$As = s$$

$$.8x + .3y = x$$

$$.2x + .7y = y$$

$$y = \frac{.2x}{.3}$$

$$.8x + .2x = x$$

$$x = x \qquad x = 0 \qquad y = 0$$

PS 2.2

20.

linear combination

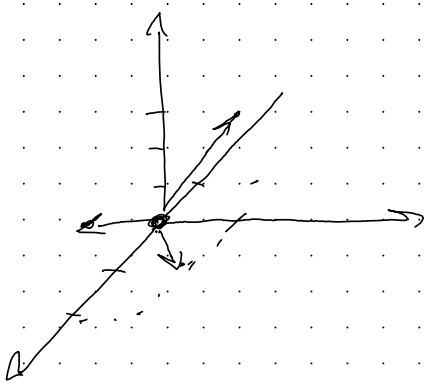
$$\begin{cases} x+y+z=0 \\ x-2y-z=1 \\ 0+3y+2z=5 \end{cases}$$

$$x+y+z=0$$
$$0-3y-2z=0$$
$$0+3y+2z=5$$

$$\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} c + \begin{bmatrix} 1 \\ -2 \\ -1 \end{bmatrix} l = \begin{bmatrix} 0 \\ 3 \\ 2 \end{bmatrix}$$

$c = 1$

$l = -1$



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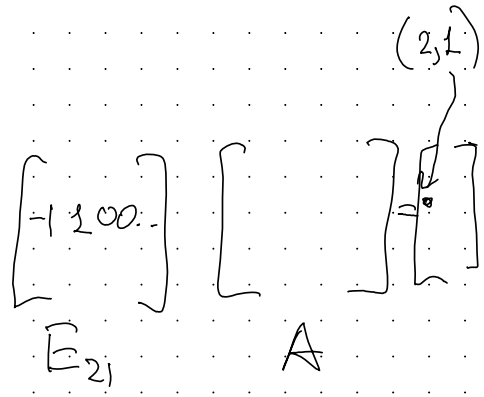
a) zero

PS 2.3

22

a) $\sum_{j=1}^{n} a_{3j} x_j$

b) $-a_{11} + a_{21}$



c) $E_{21}(E_{21} A)$

$-a_{11} + (-a_{11} + a_{21})$

$-2a_{11} + a_{21}$

d) $E_{21} A x =$

$\sum a_{1j} x_j$

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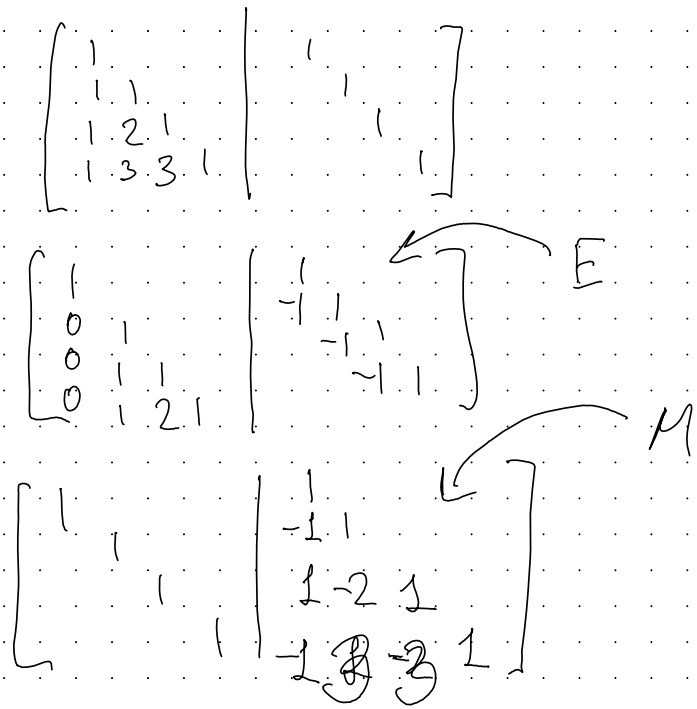

PS 2.4

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$$AX = \underline{I}$$

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$A_{m \times n}$ $B_{n \times p}$ $C_{p \times q}$

$(AB)C$

PS 2.5

7

a)
$$\begin{bmatrix} \text{row } 1 \\ \text{row } 2 \\ \text{row } 1 + \text{row } 2 \end{bmatrix} x = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{matrix} 1 & 2 & 3 & 1 \\ 5 & 5 & 6 & 0 \\ 6 & 7 & 9 & 0 \end{matrix}$$

$$\begin{matrix} 1 & 2 & 3 & 1 \\ 0 & -5 & -9 & -5 \\ 0 & -5 & -9 & -6 \end{matrix}$$