$\boxed{\text{PS 4.3}}$

$\boxed{4}$

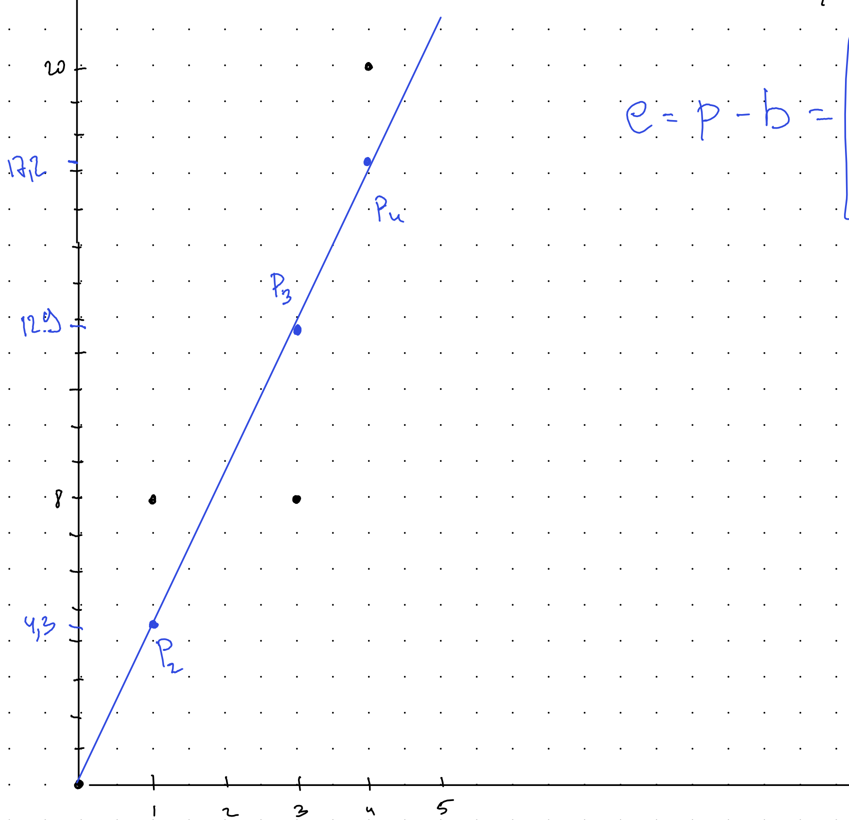
$$E = (C - 0)^2 + (C + D - 8)^2 + (C + 3D - 8) + (C + 4D - 20)^2$$

7) $b = Dt$ ✓

$$A = \begin{bmatrix} 0 \\ 1 \\ 3 \\ 4 \end{bmatrix} \qquad b = \begin{bmatrix} 0 \\ 8 \\ 8 \\ 20 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 1 & 3 & 4 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 3 \\ 4 \end{bmatrix} \hat{x} = \begin{bmatrix} 0 & 1 & 3 & 4 \end{bmatrix} \begin{bmatrix} 0 \\ 8 \\ 8 \\ 20 \end{bmatrix}$$

$$26\hat{x} = 112 \qquad \hat{x} = 112/26$$



$$e = p - b = \begin{bmatrix} 0 \\ -3{,}7 \\ 4{,}9 \\ -2{,}8 \end{bmatrix}$$

$\boxed{9}$ ✓ equation $b = C + Dt + Et^2$

$$\underbrace{\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 1 & 3 & 9 \\ 1 & 4 & 16 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} C \\ D \\ E \end{bmatrix}}_{x} = \underbrace{\begin{bmatrix} 0 \\ 8 \\ 8 \\ 20 \end{bmatrix}}_{b}$$

$$A^T A = \begin{bmatrix} 1 & 8 & 26 \\ 8 & 26 & 82 \\ 26 & 82 & \dots \end{bmatrix}$$

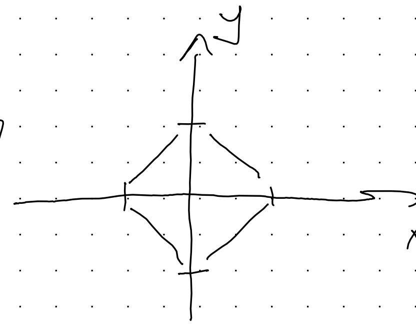
$$A^T b = \begin{bmatrix} 26 \\ 112 \\ \dots \end{bmatrix}$$

Дальше графики, где мы спроецировали b

$\boxed{26}$ ✓

eq. $C + Dx + Ey = b$

$$A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{bmatrix} \qquad b = \begin{bmatrix} 0 \\ 1 \\ 3 \\ 4 \end{bmatrix}$$



$$\hat{x} = (A^T A)^{-1} A^T b = \begin{bmatrix} 2{,}0 \\ -1{,}5 \\ -1{,}5 \end{bmatrix}$$

* Колонки ортогональные в A => получаем диагональную матрицу

$$A^T A = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

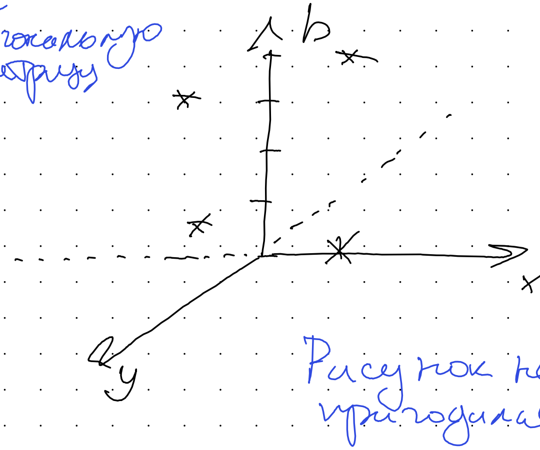


Рисунок не пригодился.

$$A^T b = \begin{bmatrix} 8 \\ -3 \\ -3 \end{bmatrix}$$

$$C = \frac{8}{4} \qquad D = \frac{-3}{2} \qquad E = \frac{-3}{2}$$

* Ещё был вопрос почему в точке x=0 y=0 ответ среднее b, я не понял вопроса.

$\boxed{29}$ ✓ unless linearly dependant or points are colinear

A hyperplane in R^n is defined by eq:

$$c_1 x_1 + c_2 x_2 + \dots + c_n x_n = d$$

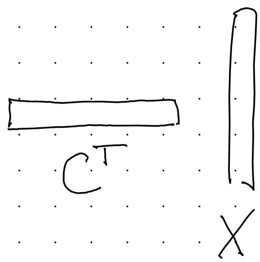
$c\,[n \times 1] \quad x\,[n \times 1]$

if d is 0 then hyperplane contains Z

$C^T x = 0$

$\uparrow$

normal vector to hyperplane



$C^T \cdot 0 = 0$

$C^T a_1 = 0$

$\vdots$

$C^T a_n = 0$

$$\begin{array}{c c c}
 & n & 1 \\
n-1 & \begin{bmatrix} - & a_1^T & - \\ - & a_2^T & - \\ & \vdots & \\ - & a_n^T & - \end{bmatrix} & \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} n \\
 & A & C
\end{array}$$

The hyperplane containing all point $a_1 .. a_n$ is unique if all vectors are independent.

Section 4.4

$\boxed{10}$

$$Q = \begin{bmatrix} | & | & | \\ q_1 & q_2 & q_3 \\ | & | & | \end{bmatrix}$$

$\boxed{18}$ seems easy

$\boxed{35}$

How to scale Q components to integers

Think how to make decomposition

$\boxed{36}$

$\boxed{\text{Section 5.1}}$

$\boxed{10}$

Entries of every row of A adds up to 0.

$Ax = 0 \Rightarrow x$ of 1s is in nullspace
so A is singular (non zero nullspace

if entries adds up to 1

$(A - I)x = 0$

x of 1s is in nullspace

Does this mean $\det(A - I) = 0$
$\det A = 1$?

Proof by example

$A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ $|A| = -1$

$\boxed{18}$ it was in recitation

$\boxed{31}$

$$\frac{1}{1+1-1} \quad \frac{1}{1+2-1} \quad \frac{1}{1+3-1}$$

$$\frac{1}{2+1-1} \quad \frac{1}{2+2-1} \quad \frac{1}{2+3-1}$$

$$\frac{1}{3+1-1} \quad \frac{1}{3+2-1} \quad \frac{1}{3+3-1}$$

$$\frac{1}{1} \quad \frac{1}{2} \quad \frac{1}{3}$$

$$\frac{1}{2} \quad \frac{1}{3} \quad \frac{1}{4}$$

$$\frac{1}{3} \quad \frac{1}{4} \quad \frac{1}{5}$$