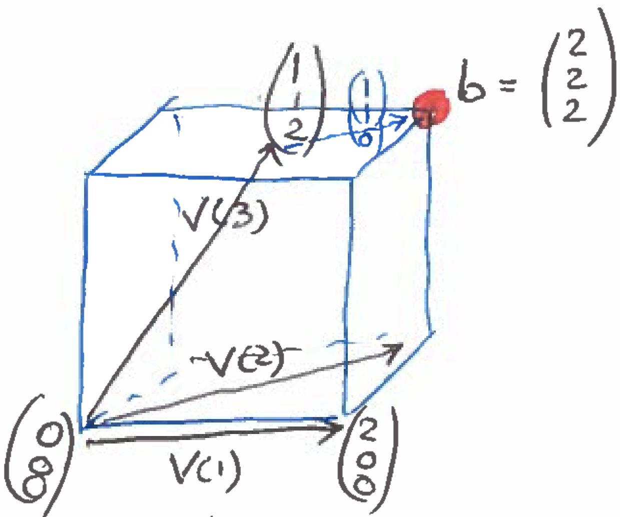
LINEAR SYSTEMS



$$\underbrace{\left[V(:,1) \quad V(:,2) \quad V(:,3) \right]}_{A}$$

$$\begin{array}{ccccc} A & & x & & \end{array}$$

$$\begin{pmatrix} 2 & 2 & 1 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 2 \\ 2 \\ 2 \end{pmatrix}$$

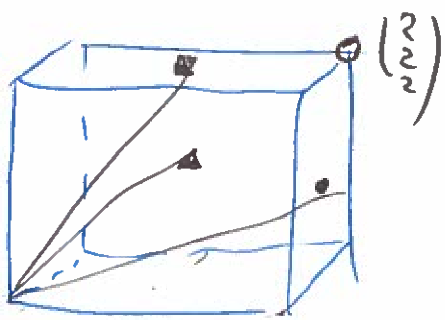
$$x = \begin{pmatrix} 0 \\ \frac{1}{2} \\ 1 \end{pmatrix}$$

"back-substitution"

for rw = n : -1 : 1,

x(rw) = b(rw) / A(rw, rw)

b = b - A(:, rw) · x(rw)



$$\begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{pmatrix} \begin{pmatrix} \\ \\ \\ \end{pmatrix} = \begin{pmatrix} 2 \\ 2 \\ 2 \end{pmatrix}$$

! understand lecture notes 44–46 !

$P(i \leftrightarrow j)$

$$\begin{array}{c|c} & \quad i \quad j \\ i & \begin{pmatrix} 1 & & & \\ & 0 & 1 & \\ & 1 & 0 & \\ & & & 1 \end{pmatrix} \\ j & \end{array}$$

A

$$\begin{pmatrix} 2 & 2 & 1 \\ 2 & 0 & 1 \\ 0 & 0 & 2 \end{pmatrix} \begin{pmatrix} \\ \\ \\ \end{pmatrix} = \begin{pmatrix} 2 \\ 2 \\ 2 \end{pmatrix}$$

permutation

$$\overset{AP}{\begin{pmatrix} 2 & 2 & 1 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix}} = \begin{pmatrix} 2 & 2 & 1 \\ 2 & 0 & 1 \\ 0 & 0 & 2 \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$PAx = P\cancel{A}b$

$x = (PA)^{-1} Pb = (A^{-1} P^{-1} Pb) = A^{-1} b$