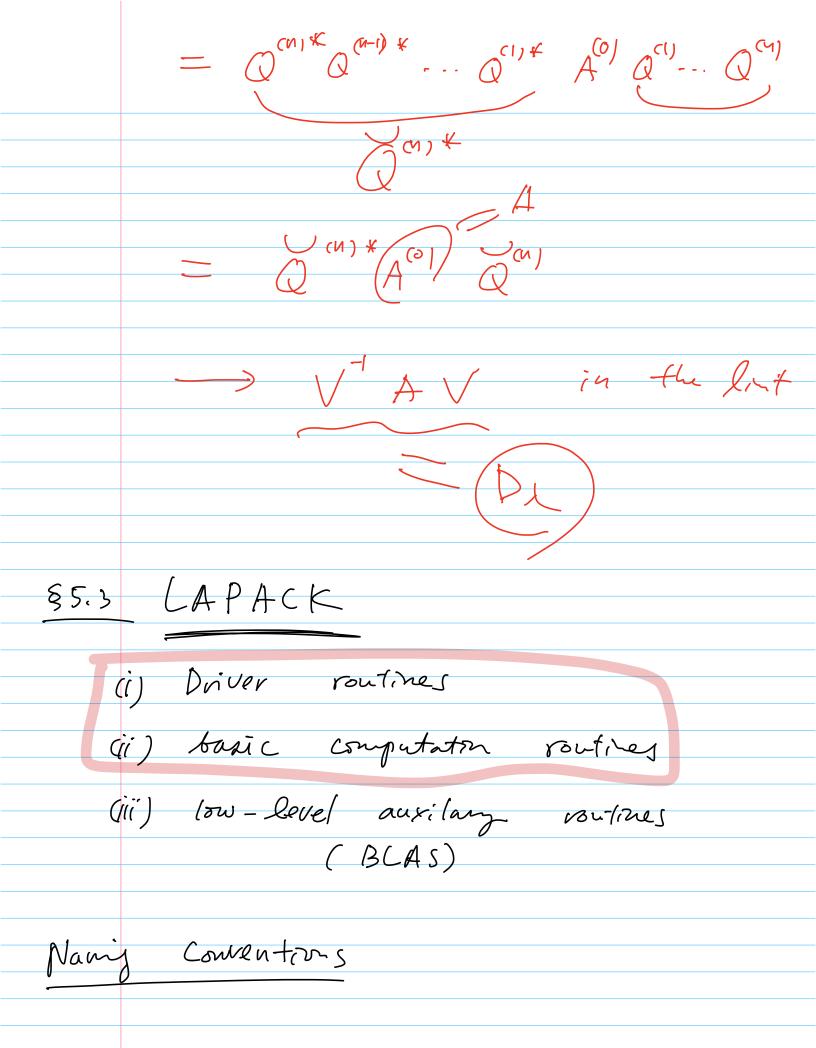
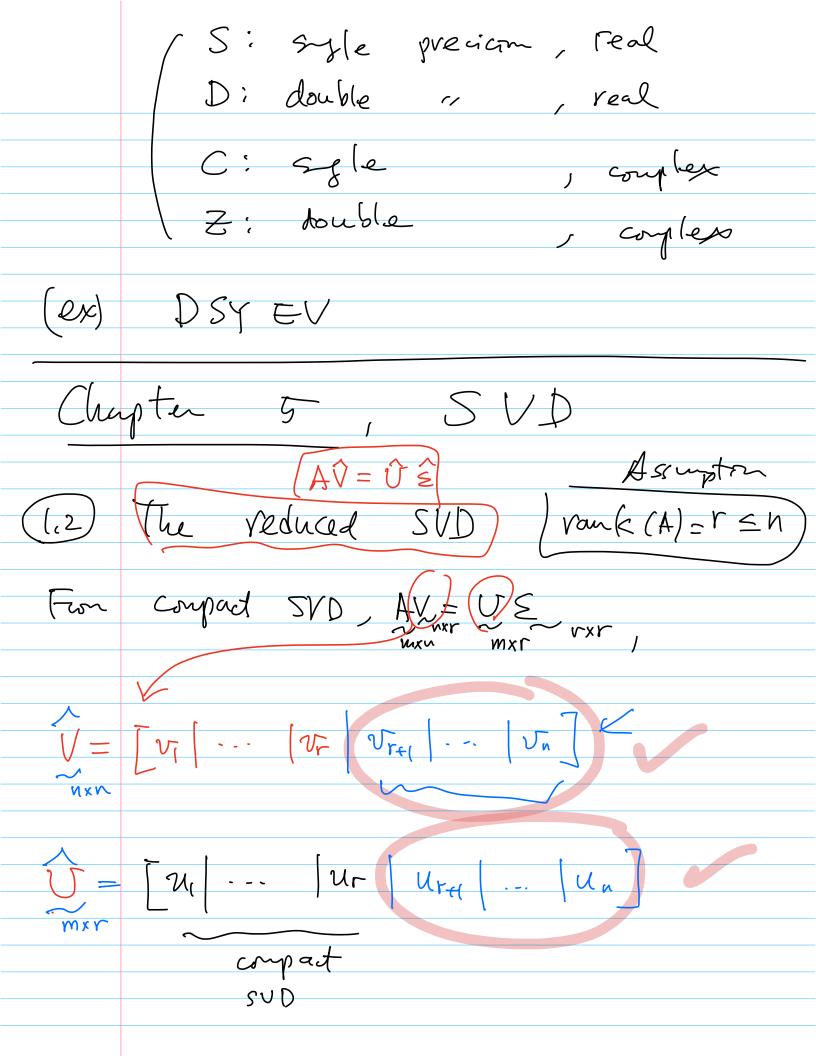
\$5.1 Complex QR alg. for Hermitian A = A* (A is non-defeative) Deig. vals : veal Deig vectors : a basic of C" 3) Unitaily digonal rubb. i.e. A = UDaU*, U: unitary => We use the complex version or " ∇R alg. (similar to the real version) $\nabla R = A$ $\nabla R = A$ 85.2 Schur decompsita for Non-Hermitian matrices The Lt A E Cuxu Then I U; untany & +

A= UTU* T = upper) Purk A B smilar to T (·) (A) = $\Delta(\tau)$ $\Delta(\tau) = \{ t_{i\bar{c}} \mid t_{i\bar{c}} = d_{i\gamma}(\tau) \}$ 3) If A is diagonalizable, then
(or $A = A^{+}$) QR W/o shife do while ever > lage $Q^{n}|_{C^{n}} = A^{n}$ Quit Acu, $A^{(u+i)} = R^{(u)} Q^{(u)}$ = Qa/* Ach, Qa,





$$A\hat{V} = \hat{U}\hat{S}, \quad \hat{\Sigma} = \begin{bmatrix} 61 \\ N \times N \end{bmatrix}$$

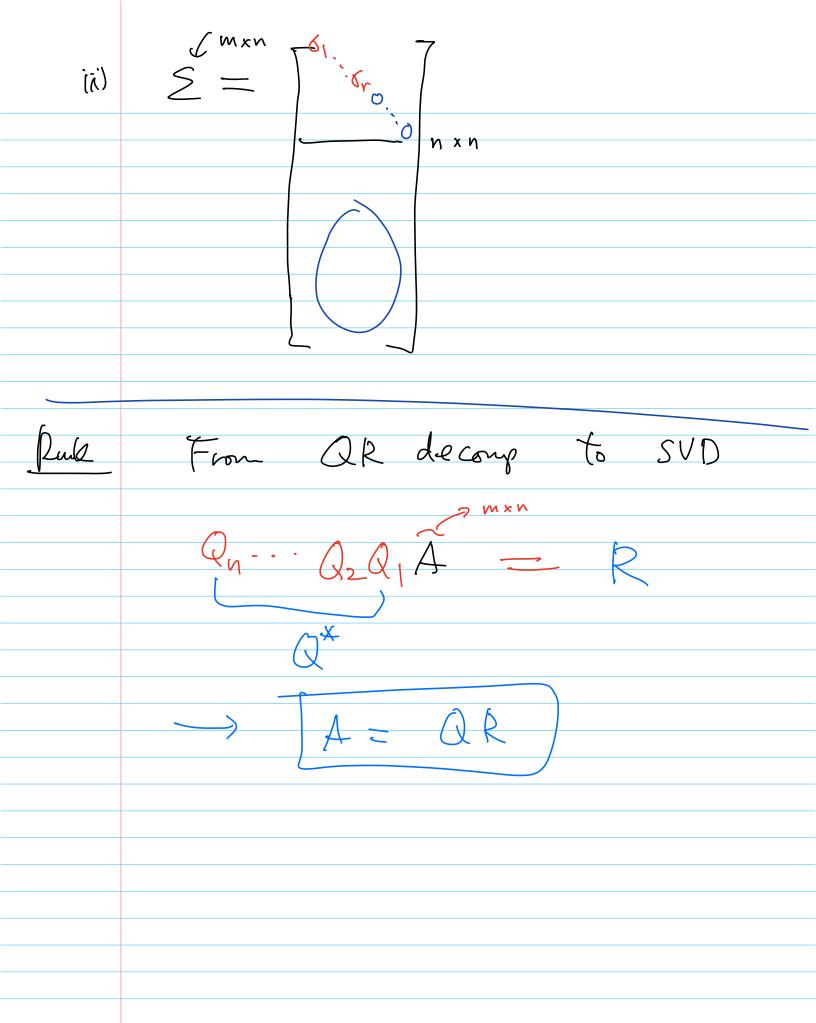
$$Srue \quad Vande \quad (A) = Y \leq N,$$

$$Av_{\bar{i}} = 0 \text{ Ni}, \quad r+1 \leq \bar{c} \leq N$$

$$= 0$$

$$(S) \quad (\text{Ker } (A) = \text{Null } (A) = \text{Sv}_{r+1}, \dots, \text{vn} \text{Sv}_{r+1}, \dots, \text{vn} \text{Sv}_{r+1}$$

$$V = \text{Volume } \text{Volume} \text{Vo$$



Ruk SVD is NOT UNGE

Ex If
$$61 = 62$$
 the

$$A = \begin{bmatrix} u_1 | u_2 \end{bmatrix} \cdot [u_m]$$

$$\begin{bmatrix} u_1 | u_2 \end{bmatrix} \cdot [u_m]$$

$$\begin{bmatrix} u_2 | u_1 | u_3 \end{bmatrix} \cdot [u_m]$$

$$\begin{bmatrix} u_2 | u_1 | u_3 \end{bmatrix} \cdot [u_m]$$

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$$\begin{bmatrix} u_1 | u_3 | u_3 | u_3 | u_3 \end{bmatrix} \cdot [u_m]$$

$$\begin{bmatrix} u_1 | u_3 | u_3 | u_3 | u_3 | u_3 \end{vmatrix} \cdot [u_m]$$

$$\begin{bmatrix} u_1 | u_3 | u_3 | u_3 | u_3 | u_3 | u_3 \end{vmatrix} \cdot [u_m]$$

$$\begin{bmatrix} u_1 | u_3 | u_$$

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

(2) Properties or 5VD

(i) SUD of real $A \in \mathbb{R}^{m \times n}$ has real orthogonal $U \notin V$

([i] It of mon-zero svalues = rank (A)

(iv) $||A||_2 = \delta_1$ $||A||_{\mathcal{L}} = \left(\delta_1^2 + \delta_2^2 + \dots + \delta_r^2\right)^{\frac{1}{2}}$

 $(V) \left| \det(A) \right| = 6 162 \cdots 6 \Gamma$

 $|A| = |det(A)| = |det(U \leq V^*)|$

$$\delta i = |\lambda i| = syn(\lambda i) \lambda i$$

Ruk
$$A^{-1} = (U \leq V^{*})^{-1}$$

$$= V \leq (U \leq V$$

Rule. A*A in tems of SVD? A*A = (U & V*) (U & V*) V > 2 / * (i) 6i² (legen) values on A*A