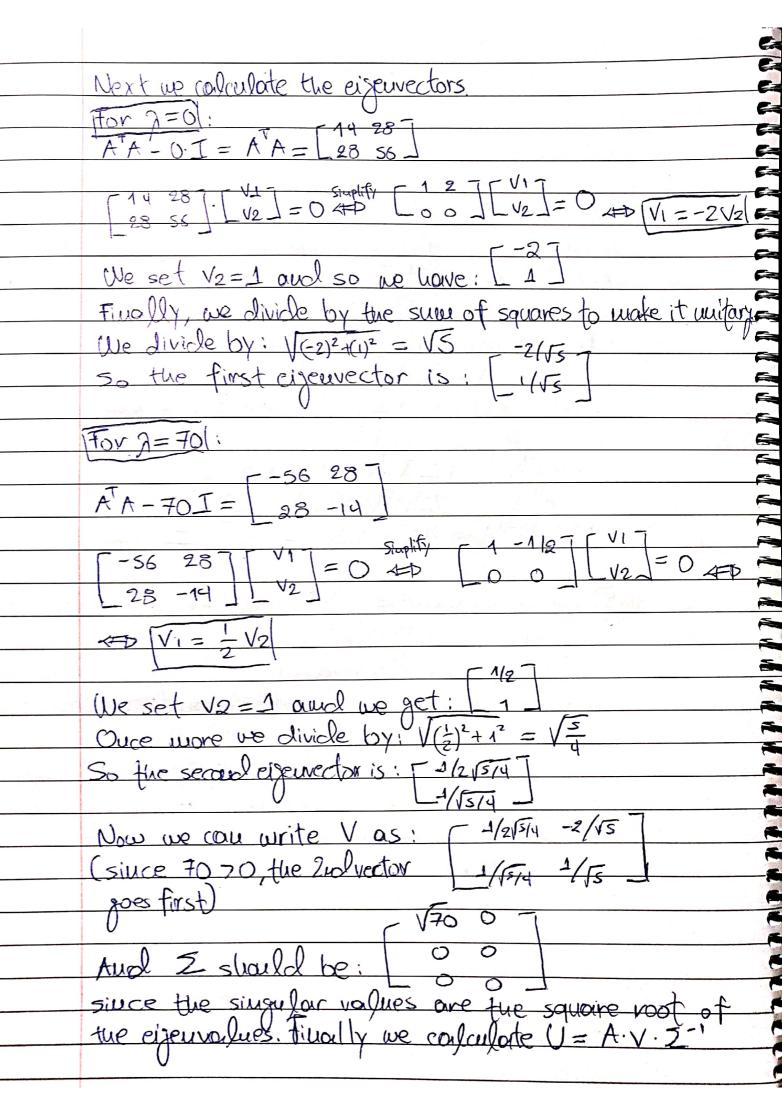
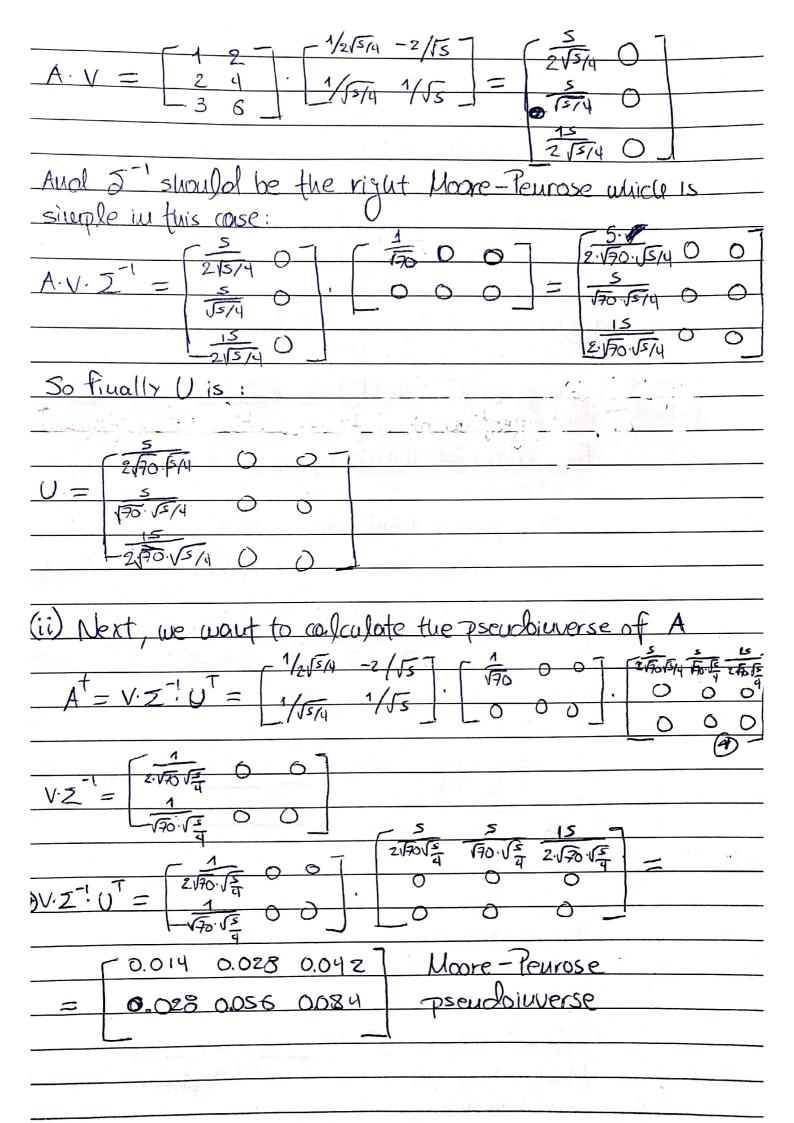
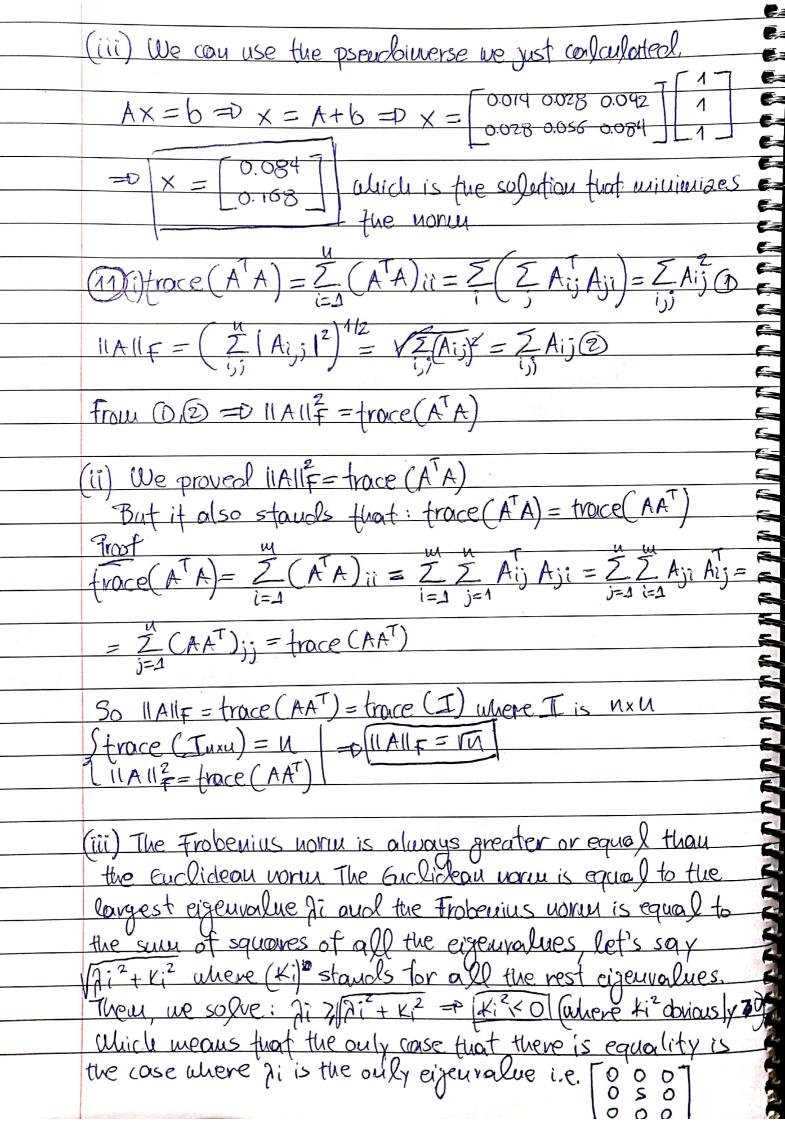
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	anolysis of the following motions (ATA)=1 Town T
	A(ATA) -1 A(ATA) -1 AT
-	· First up colosed to AT- VITOT VITOT
	First we conjugate $A^{T} = VZ^{T}U^{T} = VZU^{T}$ So $A^{T}A = VZU^{T}UZV^{T} = VZ^{2}V^{T}$ Then, $(A^{T}A)^{-1} = (VZ^{2}V^{T})^{-1} = V(Z^{2})^{-1}V^{T} = VZ^{2}V^{T}$
	They, $(A \nabla A)^{-1} = (V Z^2 V^T)^{-1} = V (Z^2)^{-1} V^T = V Z^2 V^T$
	$(A^{T}A)^{-1}A^{T} = VZ^{2}V^{T}VZ()^{T} = VZ^{-1}Z^$
	• $(A^{T}A)^{-1}A^{T} = VZ^{2}V^{T}VZU^{T} = VZ^{1}Z^{1}Z\cdot U^{T} = VZ^{-1}U^{T}$ • $A(A^{T}A)^{-1} = UZV^{T}V\cdot Z^{-2}V^{T} = UZ^{-1}V^{T}$ • $A(A^{T}A)^{-1}A^{T} = UZ^{-1}V^{T}VZU^{T} = UU^{T} = I$
1=	$A(A'A)^{-1}A' = UZ'V^{T}VZU' = UU^{T} = I$
	(12) Given motrix A = [1 2] and a vector b = [1]:
	(1) Tind the SVD analysis
	(ii) Find the pseudoinnerse of A (iii) Find the minimum norm solution for the least squares
	(i) To begin with we need to contante the eigenvalues.
	$AA = \begin{bmatrix} 1 & 2 & 3 & 1 & 2 & 2 & 4 \\ 2 & 4 & 1 & 2 & 3 & 6 & 1 \end{bmatrix} = \begin{bmatrix} 14 & 28 & 3 & 2 & 4 \\ 2 & 4 & 1 & 2 & 3 & 6 & 1 \end{bmatrix}$
	$A^{T}A - \lambda \mathbf{I} = \begin{bmatrix} 14 - \lambda & 28 \\ 28 & 56 - \lambda \end{bmatrix}$
	$\det(A^{T}A - \lambda I) = (14 - \lambda)(56 - \lambda) - 28.28 = \lambda^{2} - 70\lambda$
E track	50 our eigenvoilnes one: [7=0] and [7=70]







13) The left singular grow vectors of A one ATA eigenvectors

-> This is False since SATA = VZ2V unich shows that they LAAT = UZ2 ove the right eigenvertors -> This is false since they do have the same eigenvalues but they can also be O. · If S is a symmetric matrix, then the =0 eigenvalues of S one also its singular values -> This is False S= UZVT and Si= 17il since the eigenvalues come from \(\mathbb{Z}^2\) and therefore court be negative So if the matrix has at least 1 negative eigenvalue the statement is proven to be wrong . If A is not full-rough then O is a singular value of A -> This is True since the determinant will be D and at least one circuvalue will be O. · Given matrix A uverfible with 61,62. Gu. For every k70 the singular values of A+ k. In one G1+k, 62+k,..., Gu+k -> Without loss of generality, A is symmetric. Then Gi = [7i] and if hi=-s, Gi=5. We multiply k=7 to I and add to A. The eigenvalue Ji we said before will now be 71=-5+7=2. Similarly 512. If the statement was true then Si' should be Sitk which is 5+7=12. But si'=2 so the statement is not true for every muertible A matrix so False · The right singular vectors of A are orthogonal to A (NullCA) -> The right singular pectors are coming from VZV and specifically V is the right singular vector. So a simplified version of the statement is: The right exerupedur V of A doesn't belong to the unllspace of A or ter(A). It it did then we would here A.V=0. But A.V since V is it's eigenvector must be a linear transformation of A's columns, not O. So, we should have V=0 which is not possible since it would not be a valid eigenvetor So the statement is True!