

### Problem-3

$$(A + uv^T)^{-1} = A^{-1} - \frac{A^{-1}uv^T A^{-1}}{1 + v^T A^{-1}u}$$

multiply  $(A + uv^T)$

$$\rightarrow (A + uv^T) (A + uv^T)^{-1} = A^{-1} (A + uv^T) - \frac{A^{-1}uv^T A^{-1}uv^T}{1 + v^T A^{-1}u}$$

$$\rightarrow I = A(A + uv^T)^{-1} - \frac{A^{-1}uv^T A^{-1}uv^T}{1 + v^T A^{-1}u}$$

$$\rightarrow A(A + uv^T)^{-1} = I + \frac{A^{-1}uv^T A^{-1}uv^T}{1 + v^T A^{-1}u}$$

multiply  $(A^{-1})$

$$\rightarrow A^{-1} (A + uv^T)^{-1} = A^{-1} + \frac{uv^T A^{-1}}{1 + v^T A^{-1}u}$$

$$\rightarrow (A + uv^T)^{-1} = A^{-1} - \frac{A^{-1}uv^T A^{-1}}{1 + v^T A^{-1}u}$$

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