

Bonus HW 1

Question 1. Watch the following 5 Khan Academy videos in order to answer the following questions. Video 1 covers Q1.A through Q1.D. Video 2-3 covers Q1.E through Q1.G. Video 4 covers Q1.H-Q1.I. Video 5 covers Q1.J-Q1.K.

<https://www.youtube.com/watch?v=xyAuNHPsq-g&list=PLFD0EB975BA0CC1E0>

<https://www.youtube.com/watch?v=aKhhYguY0DQ&list=PLFD0EB975BA0CC1E0&index=2>

https://www.youtube.com/watch?v=OAh573i_qn8

<https://www.youtube.com/watch?v=TZrKrNVhbjI>

<https://www.youtube.com/watch?v=iUQR0enP7RQ&index=4&list=PLFD0EB975BA0CC1E0>

$$\mathbf{A} = \begin{bmatrix} 3 & 4 \\ 2 & 2 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$$

Question 1.A What are the dimensions of \mathbf{A} and \mathbf{B} ?

Question 1.B Find element a_{12} of matrix \mathbf{A} .

Question 1.C Find $\mathbf{A}+\mathbf{B}$.

Question 1.D Find $\mathbf{A}-\mathbf{B}$.

Question 1.E Find \mathbf{AB} .

Question 1.F Find \mathbf{BA} .

Question 1.G Does $\mathbf{AB}=\mathbf{BA}$? Is this expected?

Question 1.H Find \mathbf{A}^T . Is \mathbf{A} a symmetric matrix? Why?

Question 1.I Show that $(\mathbf{AB})^T = \mathbf{B}^T \mathbf{A}^T$

Question 1.J Find \mathbf{A}^{-1} .

Question 1.K Show $\mathbf{AA}^{-1}=\mathbf{I}$.

Question 2. Read the article (blog post) "[Principal Component Analysis 4 Dummies: Eigenvectors, Eigenvalues and Dimension Reduction](#)" by George Dallas to answer the following questions.

Question 2A. Is the horizontal or vertical line the principal component in the triangle example mentioned in the paper? Justify your answer.

Question 2B. In the triangle example, are the principal components orthogonal?

Question 2C. In the triangle example, why was the 3rd eigenvalue 0?

Question 2D. In the OxIS 2013 example, the dimension of the data set was reduced from ____ to _____. Fill in the blanks.