

Quiz #4 (CSE 4190.313)

Wednesday, May 25, 2016

Name: _____ ID No: _____

1. (10 points) Suppose A is symmetric positive definite and Q is an orthogonal matrix. True or false, with a good reason or a counter-example.
 - (a) (3 points) $Q^T A Q$ is symmetric positive definite.
 - (b) (3 points) $Q^T A Q$ has the same eigenvalues as A .
 - (c) (4 points) e^{-A} is symmetric positive definite.

2. (7 points) For a real symmetric matrix A , using the Rayleigh quotient $R(\mathbf{x})$ for a special choice of $\mathbf{x} = (x_1, \dots, x_n)^T$, discuss how the sum $\sum_{i=1}^n \sum_{j=1}^n a_{ij}$ is related to λ_1 and λ_n .

3. (8 points) Construct the SVD of a matrix with rank 1 that has

$$A\mathbf{v} = 7\mathbf{u}$$

for $\mathbf{u} = \frac{1}{2}(1, 1, 1, 1)^T$ and $\mathbf{v} = \frac{1}{3}(1, 2, 2)^T$.