

Second midterm Exam of Math 54, Fall 2008

Oct 28th 8:00-9:30am

Name _____

SID _____

Section and GSI's name _____

Note:

(1) *This is a closed book exam. No notes either. No calculators are allowed. All cellphones and other electronic devices should be off.*

(2) *Answers without explanation will not be accepted. Make sure to include your reasoning to get full credit. Write neatly and if you need extra space use the back of the pages containing the problems.*

(3) *This exam contains 4 problems, each problem is worth the number of points indicated at the beginning of the problem.*

(4) *Read all questions carefully before you start trying to answer them.*

1	
2	
3	
4	
Total	

1. (10 points)

You have found five linearly independent solutions of a homogeneous system $Ax = 0$, of 21 equations in 25 unknowns. Every solution of this system is a linear combination of these five solutions. Is it possible to find a vector b such that the corresponding nonhomogeneous system $Ax = b$ has no solution?

Explain your answer.

2. (30 points) Given the matrix

$$A = \begin{pmatrix} 0 & 0 & 2 \\ 0 & 3 & 0 \\ -2 & 0 & 0 \end{pmatrix}$$

Find its eigenvalues.

Find a matrix P and a diagonal matrix D such that

$$AP = PD.$$

Using the matrices P and D that you propose, compute separately AP and PD to check the identity.

3. (30 points) Given the matrix

$$A = \begin{pmatrix} 1/\sqrt{2} & \sqrt{2} & \sqrt{2} \\ 1/\sqrt{2} & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

Find a QR factorization of A

4. (30 points)

By setting up and solving the appropriate "normal equations" find the equation

$$y = \beta_0 + \beta_1 x$$

of the least squares line that best fits the data points (2, 6), (3, 7), (5, 11), (8, 20).