

MATH 462
Homework 1

First, read section 7.1 of Shifrin's book and make note of any parts you don't understand. Please let me know what is troubling you and I will try to clear things up. Here is a list of problems that will be collected and graded Tuesday February 12, 2007. Please write up your solutions neatly and be sure to staple your work.

1. Consider the matrix:

$$A = \begin{pmatrix} 0 & 2 & 2 \\ 2 & 4 & -3 \\ -1 & -2 & 1 \end{pmatrix}$$

2. Let $b = \begin{pmatrix} -4 \\ 3/2 \\ 0 \end{pmatrix}$. Find the solution to the equation $Ax = b$ using Gaussian elimination.
3. Let $b = \begin{pmatrix} -4 \\ 3/2 \\ 0 \end{pmatrix}$. Find the solution to the equation $Ax = b$ by computing the inverse of the matrix A .
4. Recall that the column space of a matrix is the set of all vectors that are expressible as a linear combination of the columns of the matrix. Show that the vector $b = \begin{pmatrix} -4 \\ 3/2 \\ 0 \end{pmatrix}$ is in the column space of A .
5. Suppose that $T : \mathbb{R}^3 \rightarrow \mathbb{R}^4$ is a linear transformation defined by the equation:

$$T \left(\begin{pmatrix} x \\ y \\ z \end{pmatrix} \right) = \begin{pmatrix} 3x \\ -2y \\ 2x + 3z \\ x + y + z \end{pmatrix}.$$

Find a matrix $[T]$ so that

$$[T] \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3x \\ -2y \\ 2x + 3z \\ x + y + z \end{pmatrix}.$$

6. Let $f \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \sqrt{xy} \\ \sqrt{x} + \sqrt{y} \end{pmatrix}$. Use a linear approximation to approximate $f \begin{pmatrix} 26 \\ 50 \end{pmatrix}$.

7. Use Lagrange multipliers to find the maximum and minimum values of the function $f \begin{pmatrix} x \\ y \\ z \end{pmatrix} = yz + xy$ subject to the constraints $xy - 1 = 0$ and $y^2 + z^2 = 1$.
8. Shifrin page 274 #2.
9. Shifrin page 274 #3.
10. Shifrin page 274 #4.