MATH256 Spring-2012, MT-I Exam Date: 2/4/12

*The books, GSM phones and calculators are not allowed. The lecture notes can be used. All the answers must be clearly stated, otherwise no partial credit will be given.The duration is 100 minutes.*

1. a) Let A is an mxn matrix, where m=10 and n=40. Determine the maximum dimension for the column space and the null space of A matrix. (10 pts)

a) Write the vector that shows the function x2+3x+5 in a space which has the basis: 1,x,x2 (2 pts)

b) Write the vector that shows the function 2cos(x) in a space which has the basis: ejx,e-jx(5 pts)

 c) What is the base functions fort the space including ALL of the periodic functions (5 pts)

 d) S space is all of the 3x3 matrices with the following form: (5 pts)

 $\left[\begin{matrix}β&∝&2∝\\∝&β&∝\\2∝&∝&β\end{matrix}\right] where ∝and β \in R $, write the basis and dimension of S space.

1. $A=\left[\begin{matrix}1\\2\\-1\end{matrix}\begin{matrix}\\\\\end{matrix}\begin{matrix}5\\4\\7\end{matrix}\begin{matrix}\\\\\end{matrix}\begin{matrix}7\\6\\9\end{matrix}\begin{matrix}\\\\\end{matrix}\begin{matrix}9\\8\\11\end{matrix}\right]$
2. Find the basis for N(A) (Nullspace of A matrix) (15 pts). How many dimensions N(A) has (5 pts)? Inside how many dimensions (5 pts)?
3. Find the basis spanning the remaining dimensions in the space containing N(A) (15 pts)?

**Select one of the following questions. (3 or 4), If both question is answered *only* the first answered will be evaluated.**

1. Consider the following equation set,

$$Eq1: x+∝y+5z+3t=1$$

$$Eq2: 3x+3y+∝^{2}z-9t=2$$

$$Eq3: x+y+3z+∝t=2/3$$

Calculate $∝$ if that equation set has infinite solutions spanning a 2-dimensional plane(25 pts). Calculate the complete solution using the calculated $∝$ value (15 pts)

1. Consider the equation set below:

$$Eq1: x+3y+5z=1$$

$$Eq2: 3x+y+z=5$$

a) Find all $b=\left[\begin{matrix}\begin{matrix}b\_{1}\\b\_{2}\end{matrix}\\\begin{matrix}b\_{3}\\b\_{4}\end{matrix}\end{matrix}\right]$ vectors, if the following equation can be written as the linear combination of Eq1 and Eq2. (30 pts)

$$Eq: b\_{1}x+b\_{2}y+b\_{3}z=b\_{4}$$

b) Is the vector set found in (a) form a subspace in $R$4 (10 pts)?