

Exam 2: MAP 4403*

December 1, 2004

Name:

Student ID:

Provide all details of your work; no details \Rightarrow no credit.

1. What is the potential between the cylinders $|z| = 1$ having potential 100 Volts and $|z - i/3| = 0.5$ having potential 0 Volts?

2. Is the set of (real) vectors

$$S = \{(x_1 \ x_2) \mid x_1 x_2 = 0\}$$

a vector space?

3. Determine the rank of the following matrix:

$$\begin{pmatrix} 0 & 0 & -6 & -3 & 0 \\ 1 & 2 & 1 & 0 & -1 \\ 1 & 0 & 1 & 1 & 3 \\ 1 & 1 & 4 & 2 & 1 \end{pmatrix}$$

Determine a basis for the row space of A and a basis for the column space of A .

4. What is the general form of the solution of the system:

$$\dot{x} = \begin{pmatrix} -1 & -1 \\ -3 & 2 \end{pmatrix} x?$$

What is the solution corresponding to the initial condition $x_1(0) = 1, x_2(0) = 0$?

Determine what the type of the equilibrium point at the origin is and discuss stability.

5. Using the method of variation of parameters, find the solution of the system:

$$\dot{x} = \begin{pmatrix} -1 & 0 \\ -3 & 2 \end{pmatrix} x + \begin{pmatrix} 2e^{-t} \\ 3e^{-3t} \end{pmatrix}$$

DUE DATE: In our classroom at the beginning of class (that is before 9 : 35 am) on Monday December 6. Late exams will not be graded.

*Instructor: Patrick De Leenheer.