

DYNAMICAL SYSTEMS AND BIFURCATION THEORY
METODI ANALITICI PER PROBLEMI DIFFERENZIALI

Prova intermedia del 16 ottobre 2008

Durata della prova: 60 minuti

Cognome e nome: _____

Matricola: _____

Exercise 1

Consider the linear system

$$\dot{x} = Ax, \quad A = \begin{pmatrix} -5 & 9 \\ -4 & 7 \end{pmatrix}.$$

1. Reduce the matrix A in Jordan canonical form.
2. Find the solution of the linear system with initial condition $x(0) = x_0$.
3. Draw the phase portrait both in the coordinates for which A is reduced in Jordan canonical form and in the original coordinates.
4. Classify the origin $x = 0$ according to the previous discussion.

Exercise 2

Consider the linear system

$$\dot{x} = Ax, \quad A = \begin{pmatrix} 1 & 0 & -4 \\ 0 & -2 & 5 \\ 1 & 0 & 1 \end{pmatrix}.$$

Find and draw in \mathbb{R}^3 the stable, unstable and center subspaces.