MATH 240
DIFFERENTIAL EQUATIONS
Final Exam

July 29 , 2002
Monday 09.40-11.40, SAZ-04-SAZ-8

QUESTIONS: Solve only four problems

[25]**1**. Solve the initial value problem $\frac{dX}{dt} = A\,X$ where

$$A = \begin{pmatrix} 5 & 0 & 4 \\ -6 & 1 & -1 \\ -6 & 0 & -5 \end{pmatrix}, \qquad X(0) = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

[25]**2**. Solve the following initial value problem by using the Laplace trasnform

$$y'''' - 4y''' + 6y'' - 4y' + y = 0$$
$$y(0) = 0,\ y'(0) = 1,\ y''(0) = 0,\ y'''(0) = 1.$$

[25]**3**. Find the regular solutions of the equation

$$y'' + \frac{1}{t(1+t)}y' - \frac{1}{1+t}y = 0$$

near its regular singular points.

[25]**4**. Find the general solution of the differential equation

$$t^3\,y''' - t^2\,y'' + 2ty' - 2y = t^3$$

[25]**5**. Solve the following differential equation near its regular singular point

$$t^2y'' + ty' + t^2y = 0$$