Math 583 A
Homework Assignment # 4

Due October 1, 1998

1 Ordinary differential equations - Part II

1. Solve $y^{(4)} - 8y'' - 9y = 6x + 12\sin(x)$
2. Solve $\left\{ \begin{array}{l} \dot{x}_1 = 2x_1 + x_2 + 2e^t \\ \dot{x}_2 = -3x_1 - 2x_2 + 4e^t \end{array} \right. .$
3. Find a fundamental matrix for the system $\dot{X} = AX$ where $A = \begin{bmatrix} 4 & 1 & 0 \\ 0 & 4 & 1 \\ 0 & 0 & 4 \end{bmatrix}$.

2 Analytic functions

1. The following are real parts of analytic functions of $z = x + iy$. For each case, find the imaginary part and express the function in terms of z (up to an arbitrary constant).
   (a) $3x^2y - y^3$
   (b) $2x(c - y)$, where c is a constant
   (c) $\dfrac{y}{x^2 + y^2}$
   (d) $\cosh(y)\cos(x)$
2. Determine whether the following functions are analytic (use the Cauchy-Riemann equations). Do they have singular points ?

   (a) $\tan(z)$ (b) $e^{\sin(z)}$ (c) $e^{1/(z-1)}$ (d) $e^{\bar{z}}$

   (e) $\cos(x)\cosh(y) - i\sin(x)\sinh(y)$ (f) $\dfrac{z}{z^4 + 1}$