MATH 319 First Midterm Exam-Spring 1998

1. Solve the following two initial value problems.

(a)
$$\begin{cases} (1+x^2)\frac{dy}{dx} + y = \arctan(x) \\ y(0) = K \end{cases}$$

(b)
$$\begin{cases} \frac{dy}{dx} - \frac{y^3}{1+x^2} = 0\\ y(0) = K \end{cases}$$

(b)
$$\begin{cases} y''(x) - 3y'(x) - 4y(x) = e^{-x} \sin 2x \\ y(0) = 0, \quad y'(0) = K \end{cases}$$

2. Find the general solution the following differential equation,

$$y''(x) - \frac{2}{1+x^2}y(x) = 0$$

given that $y(x) = 1 + x^2$ is a solution.

3. Consider the system of differential equations,

$$\begin{cases} y''(t) = y(t) + z(t) \\ z''(t) = 6y(t) + 2z(t) \end{cases}$$

(a) Find a differential equation for y(t) only, by eliminating z(t).

(b) Find the general solution of the differential equation you obtained in (a).

(c) Find the solution which satisfies y(0) = 1, y'(0) = 0, z(0) = 1, z'(0) = 0.

Your Name:							
1a	1b	1c	2	3a	3b	3c	Total