Math 583 A
Homework Assignment # 3

Due September 24, 1998

Ordinary differential equations - Part I

1. Show that, when it exists, the singular solution to the Clairaut equation $y = y'x + f(y')$ is the envelope of the family of straight lines corresponding the to general solution of this equation.

2. Solve $y' = \dfrac{4}{x^2} - \dfrac{y}{x} - y^2$.

3. Solve $x\ dy + \left(xy + 2y - 2e^{-x}\right)\ dx = 0$ with $y(1) = 0$.

4. Solve $y'' - y = \sinh(x)$.

5. Find the general solution to $x^2y'' - 2xy' + 2y = x^3 \ln(x),\ x > 0$. Consider making the change of variable $x = e^t$.

6. Find the general solution to

$$(x^2 + x)y'' + (2 - x^2)y' - (2 + x)y = (x + 1)^2.$$