MA/PHY506 Fall 2012 Problem Set 2 DUE: 21 September 2012

1. First order ODE: Find the most general solutions to:

(a) $(2xy^2 + 2y) + (2x^2y + 2x)y' = 0$ (b) $y' = e^{2x} + y - 1$

- 2. Arken, Chapter 7, pages 341: 7.2.13 and 7.2.18 .
- 3. Second order ODE: Arken, Chapter 7, pages 346, problems 7.4.1, 7.4.2, 7.4.4.
- 4. Study the power series solutions about $x_0 = 0$ to Hermite's equation: $y'' - 2xy' + 2\lambda y = 0$. Show that this equation is obtained from the quantum mechanical harmonic oscillator Schrödinger equation $-\psi'' + x^2\psi = E\psi$ by writing $\psi(x) = y(x)e^{-x^2/2}$ and $2\lambda = E - 1$. For what values of λ does one have a polynomial solution?