MA/PHY506 Fall 2017
Problem Set 3
DUE: 25 September 2017

1. 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? Write out the first few polynomial solutions. These, properly normalized, are the Hermite polynomials.

2. Find a basis of the solution space to the ODE:

$$y''' - 2y'' - y' + 2y = 0$$

What is the unique solution satisfying: $y(0) = 0$, $y'(0) = 0$ and $y''(0) = 1$?