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 $\lambda$ does one have a polynomial solution? Write out the first few polynomial solutions. These, properly normalized, are the Hermite polynomials.