CHEM 3364 Special Functions Modeling Lab SPRING 2006

Harmonic Oscillator/Hermite Polynomials

The solutions of the Schrödinger equation for the harmonic oscillator potential energy, $V(x) = \frac{1}{2}kx^2$, have the form: $\psi(v,y) = N(v) \cdot Her(v,y) \cdot e^{-\frac{y^2}{2}}$ where $N(v) = \left(2^v \cdot \pi^{\frac{1}{2}} \cdot v!\right)^{-\frac{1}{2}}$ is the normalization constant and Her(v, y) is the Hermite polynomial associated with the vibrational quantum number, v.

Hermite Polynomials

We want to examine the behavior of the Hermite polynomials. Using Mathcad and Her(v, y) as the Hermite polynomial function, **plot the first ten Hermite polynomials**. Using good style print these plots on a separate sheet of paper, i.e., conserve paper!

1. Are the polynomials finite?

2. Describe how the polynomials change with increasing quantum number.

Harmonic Oscillator Wavefunctions

Plot the first ten harmonic oscillator wavefunctions. Using good style, print these plots on a separate sheet of paper.

1. How are the wavefunction plots different than the polynomial plots?