

Numerical Solutions for the Radial Equation for the 2D Oscillator

Reduced mass: $\mu := 1$ Angular momentum: $L := 2$ Integration limit: $r_{\max} := 5$

Force constant: $k := 1$ Energy guess: $E := 3$

Solve Schrodinger's equation numerically use Mathcad's ODE solve block:

Given

$$\frac{-1}{2 \cdot \mu} \cdot \frac{d^2}{dr^2} \Psi(r) - \frac{1}{2 \cdot \mu \cdot r} \cdot \frac{d}{dr} \Psi(r) + \left(\frac{L^2}{2 \cdot \mu \cdot r^2} + \frac{1}{2} \cdot k \cdot r^2 \right) \cdot \Psi(r) = E \cdot \Psi(r) \quad \Psi(.001) = .1 \quad \Psi'(.001) = 0.1$$

$$\Psi := \text{Odesolve}(r, r_{\max}, .001) \quad \Psi(r) := \left(\int_0^{r_{\max}} \Psi(r)^2 \cdot 4 \cdot \pi \cdot r^2 dr \right)^{\frac{-1}{2}} \cdot \Psi(r)$$

