

Homework Set 9. Due Friday November 4 at 10.30 am

1. Show that the Tchebychev polynomials T_n satisfy the Christoffel-Darboux formula,

$$\sum_{k=0}^{N-1} T_k(x)T_k(y) = B_{N-1} \frac{T_N(x)T_{N-1}(y) - T_{N-1}(x)T_N(y)}{x - y}. \quad (1)$$

2. Do Exercise (2.12), p. 77 of Goldbart and Stone.

3. Consider the wave functions of the harmonic oscillator

$$\psi_n(x) = e^{-x^2/2} H_n(x). \quad (2)$$

Show that they satisfy the Schrödinger equation

$$-\frac{d^2}{dx^2}\psi_n(x) + x^2\psi_n(x) = (2n + 1)\psi_n(x). \quad (3)$$