Reading: Boas Chapter 12 sections 2 - 6

Dirac Notation notes on the website

- (1) Use the Rodrigues formula for Hermite polynomials to show that
 - (a) $H_n(x)$ is an even function for even n and odd function for odd n. (b) and

$$H_{n+1}(x) - 2xH_n(x) + H'_n(x) = 0.$$

(2) Consider the Sturm-Liouville eigenvalue problem

$$L \mid u \rangle + n(n+1) \mid u \rangle = 0$$

over the interval $-1 \le x \le 1$ with boundary conditions that $u(\pm 1)$ are finite and

$$L = (1 - x^2)\frac{d^2}{dx^2} - 2x\frac{d}{dx}$$

- (a) Is L self-adjoint? Explain.
- (b) Solve the eigenvalue problem (I recommend "by inspection" you have seen this before...), i.e. find the solutions u(x).
- (c) Are the solutions orthogonal?
- (d) What are the resulting functions normally called?