PHYS 23410 Notes

5/10:

- Labalme (2024, pp. 34–37): Much more detailed asymptotic analysis and derivation of the Hermite equation.
  - Here, we properly motivate the $H(y)\mathrm{e}^{-y^2/2}$ that was just supplied last time.
  - Hermite polynomials are eventually defined via the following formula, which is *not* derived.

$$H_n(\xi) = (-1)^n \exp\left(\xi^2\right) \frac{\mathrm{d}^n}{\mathrm{d}\xi^n} \left[\exp\left(-\xi^2\right)\right]$$

- Labalme (2024, pp. 65–66): Legendre polynomials.
  - Labalme (2023) actually does a better job of deriving Legendre's equation and motivating why we need the associated Legendre functions.
  - The Legendre polynomials are given by Rodrigues' formula:

$$P_\ell(u) = \frac{1}{2^\ell \ell!} \frac{\mathrm{d}^\ell}{\mathrm{d}u^\ell} \left(u^2 - 1\right)^\ell$$

  - The associated Legendre functions are defined as in Labalme (2023).