Assignment 4

https://github.com/jchryssanthacopoulos/quantum_information/tree/main/assignment_4

Quantum Information and Computing
AA 2022–23

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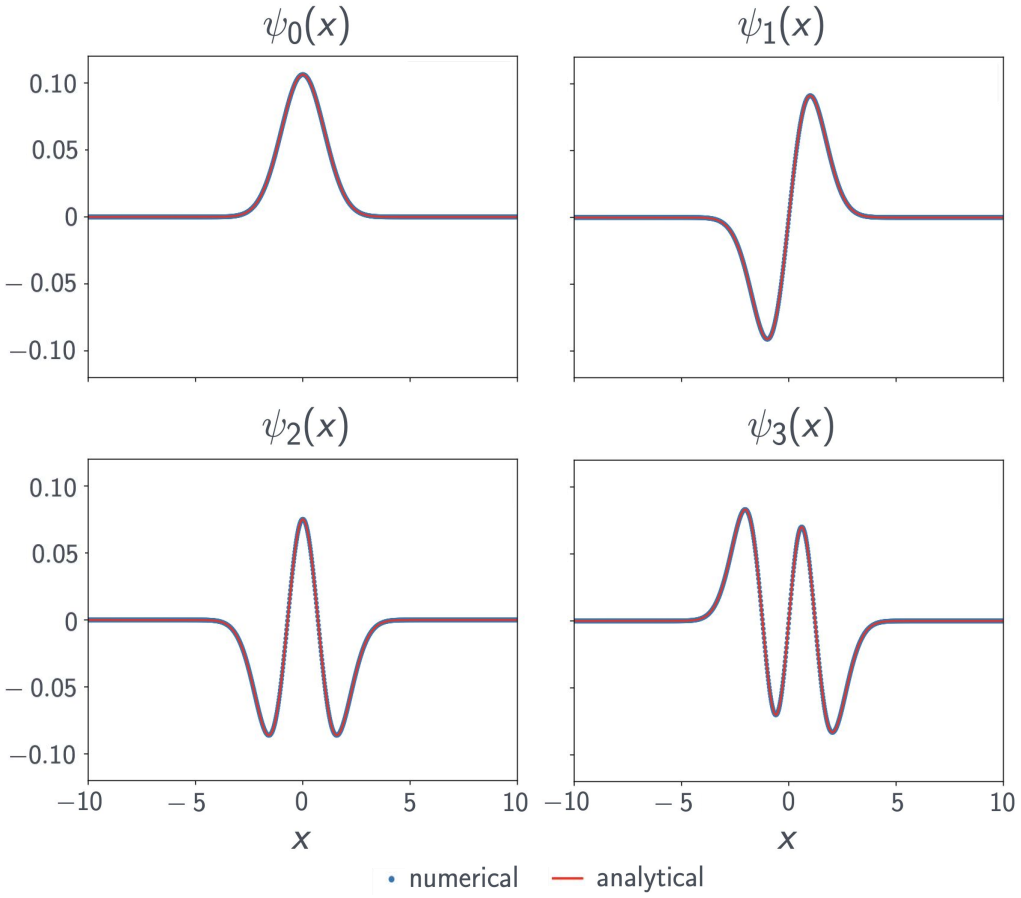
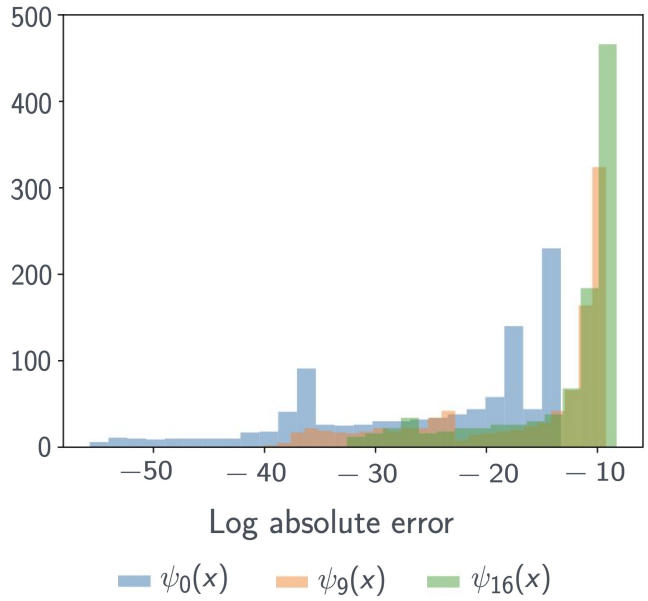
Eigenfunctions

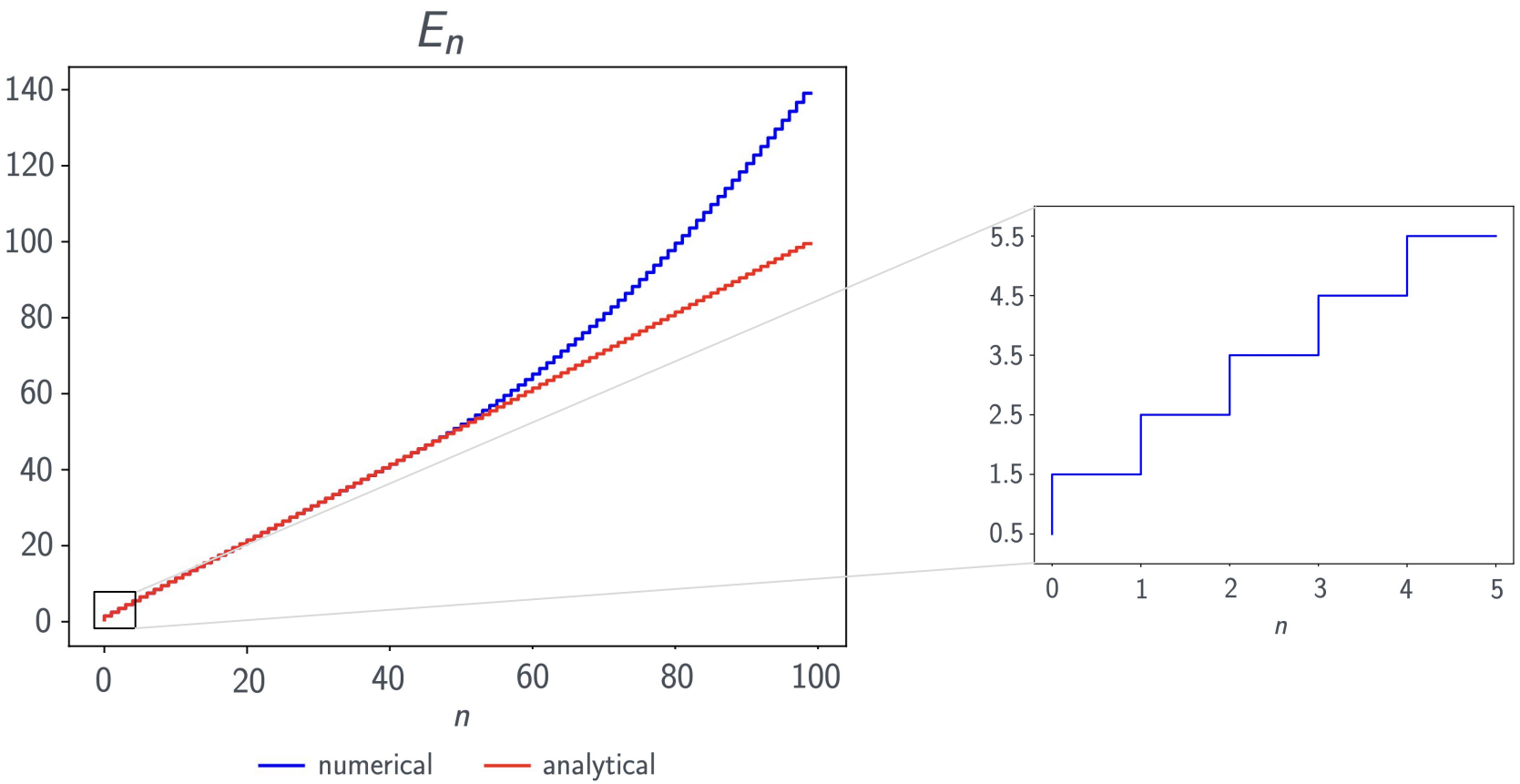
- Eigenfunctions given by $\psi_n(x) = \frac{1}{\sqrt{2^n n!}} \left(\frac{1}{\pi}\right)^{1/4} \exp\left(-x^2/2\right) H_n(x)$
- Good match to expected values using $N = 1000$ and $x_{\max} = 10$, but error increases with n, particularly around edges of domain boundaries





Eigenvalues

- Eigenvalues given by $E_n = n + \frac{1}{2}$
- Good match to expected values, but again, error increases with n



Sensitivity Analysis

- Discretization sensitive to range of x, but not very sensitive to N (beyond a certain threshold)
- Best overall results found for $x_{\max} = 10$