Numerieke methoden in de natuurwetenschappen

Ex. 4: Numerical integration

The purpose of this exercise is to apply as many as possible (but at least the trapezoidal and Simpson's rules) of the algorithms for numerical integration described in chapter 4 of the book by Burden and Faires. You will use the algorithms for integration to normalize the wavefunction of the lowest bound state of a finite QW for which you have calculated the energy as a function of the potential depth in the first exercise. Consider now two values of the potential depth, $V_0 = 1., 2.$ eV and (re)calculate the energy. Once you know the energy, calculate the wavefunction and estimate the decay length of the wavefunctions in the forbidden barrier regions (or plot the wavefunction) in order to define the range in which it is non-zero. Integrate the wavefunction in this range in order to normalize it. For instance, apply the Simpson rule to calculate the integral of $|\psi|^2$ on different grids of points in the above range. In defining the grid of points on which the wavefunction is calculated to perform the integration choose a spacing which fits into the well.