Consider the wavefunction

\[ \Psi_2(x) = b \cos \left( \frac{2\pi x}{L} - \frac{i \pi}{2} \right), \]

again for a particle constrained to move along the \( x \) axis between the coordinates 0 and \( L \).

(a) Determine the normalization constant \( b \). (You may reuse any results from problem Basics 1.)

Next, suppose we place this particle in the superposition state described by the following wavefunction:

\[ \Psi(x) = N \left( \Psi_1(x) + \Psi_2(x) \right). \]

(b) Calculate the normalization constant \( N \). Try to reuse what you already know, to avoid evaluating more than one integral.