4) Consider a particle of charge \( q \) and mass \( m \) moving around a one-dimensional ring of circumference \( L \), described by the wavefunction

\[
\psi_n(x) = \sqrt{\frac{1}{L}} \exp(ik_n x).
\]

a) Calculate the probability current, and the electrical current circulating in the ring.

b) Compare the result for the electrical current found in part (a) to what you would expect for a classical particle with the same velocity.