Problem 2.32  The electron concentration in a piece of lightly doped, $n$-type silicon at room temperature varies linearly from $10^{17}$ cm$^{-3}$ at $x = 0$ to $6 \times 10^{16}$ cm$^{-3}$ at $x = 2$ μm. Electrons are supplied to keep this concentration constant with time. Calculate the electron current density in the silicon if no electric field is present. Assume $\mu_n = 1000 \text{ cm}^2/\text{V-s}$ and $T = 300 \text{ K}$. 