Exercise 9.1. Derive Eq. 9.7 by plugging Eq. 9.6 into Eq. 9.5.

We are given

$$-\frac{\hbar^2}{2m}\frac{\partial^2\psi(x)}{\partial x^2} = E\psi(x) \tag{9.5}$$

$$\psi(x) = \exp\left(\frac{ipx}{\hbar}\right) \tag{9.6}$$

$$E = \frac{p^2}{2m} \tag{9.7}$$

For the $\psi(x)$ given in equation (9.6) we have

$$\frac{\partial^2}{\partial x^2}\psi(x) = -\frac{p^2}{\hbar^2}\psi(x) \tag{1}$$

Substitute (1) into (9.5) to obtain

$$\frac{p^2}{2m}\psi(x) = E\psi(x)$$

Hence

$$\frac{p^2}{2m} = E$$