Exercise 10.1. Find the second time derivative of x in Eq. 10.9, and thereby show that it solves Eq. 10.8.

We are given

$$-\omega^2 x = \ddot{x} \tag{10.8}$$

$$x = A\cos(\omega t) + B\sin(\omega t) \tag{10.9}$$

Hence

$$\ddot{x} = \frac{d^2}{dt^2}[A\cos(\omega t) + B\sin(\omega t)] = -A\omega^2\cos(\omega t) - B\omega^2\sin(\omega t) = -\omega^2 x$$