***8/144** $I = \int F\,dt = m\dot{x}$, $8 = 4\dot{x}$, $\dot{x} = 2$ m/s at $t \approx 0$

After impulse, oscillator obeys Eq. 8/9 with $\zeta = 0.1 < 1$ so underdamped with solution given by Eq. 8/12

$$x = Ce^{-\zeta\omega_n t}\sin(\omega_d t + \psi), \quad C, \psi \text{ constants}$$

$$\dot{x} = -C\zeta\omega_n e^{-\zeta\omega_n t}\sin(\omega_d t + \psi) + Ce^{-\zeta\omega_n t}\omega_d \cos(\omega_d t + \psi)$$

where $\omega_n = \sqrt{k/m} = \sqrt{200/4} = 7.07$ rad/s,

$$\omega_d = \omega_n\sqrt{1-\zeta^2} = 7.07\sqrt{1-0.1^2} = 7.04 \text{ rad/s}$$

When $t = 0$, $x = 0$, so $0 = C\sin\psi$, $\psi = 0$

" " , $\dot{x} = 2$ m/s, so $2 = -C(0.1)(7.07)(0) + C \times 7.04$, $C = 0.284$ m

Thus $\underline{x = 0.284\,e^{-0.707t}\sin 7.04t}$