

*8/142 $I = \int F dt = m\dot{x}$, $8 = 4\dot{x}$, $\dot{x} = 2 \text{ m/s}$ 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

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

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

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

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

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

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

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

