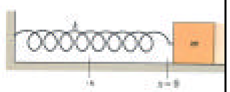
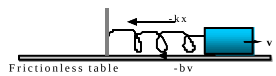
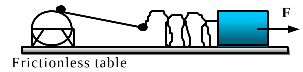
Review

	Simple harmonic	With damping	Forced, with/without damping
System			
Equation of motion	$\ddot{x} + \frac{k}{m}x = 0$	$\ddot{x} + \frac{b}{m}\dot{x} + \frac{k}{m}x = 0$	$\ddot{x} + \frac{b}{m}\dot{x} + \frac{k}{m}x = (F_0/m)\cos\omega t$
Constants	$\omega_0 = \sqrt{\frac{k}{m}}$	$\omega_0 = \sqrt{\frac{k}{m}};\quad \gamma = \frac{b}{m}$ **Critical condition:** $\omega_0 = \frac{\gamma}{2}$	$\omega_0 = \sqrt{\frac{k}{m}};\quad \gamma = \frac{b}{m}$
Solution	$x(t) = A\cos\omega_0 t$	$x(t) = A_0 e^{-\gamma t/2}\cos\omega t$ **overdamped and critically damped oscillators: no harmonic component**	$x(t) = \frac{\frac{F_0}{m}}{\left[\left(\omega_0^2 - \omega^2\right)^2 + \gamma^2\omega^2\right]^{1/2}}\cos\omega t$
Frequency	$\omega_0 = \sqrt{\frac{k}{m}}$	$\omega^2 = \omega_0^2 - \frac{\gamma^2}{4}$ ω **depends on both: system (k,m) and damping force (b)**	ω **is the frequency of the driving force**
Amplitude	**A = constant**	$A(t) = A_0 e^{-\gamma t/2}$ **It is a function of time; it depends on mass (m) and damping force (b)**	$A(\omega) = \frac{\frac{F_0}{m}}{\left[\left(\omega_0^2 - \omega^2\right)^2 + \gamma^2\omega^2\right]^{1/2}}$ **It is a function of** ω. **It depends on: oscillator (k,m), damping force (b), driving force (F_0,** ω**)**