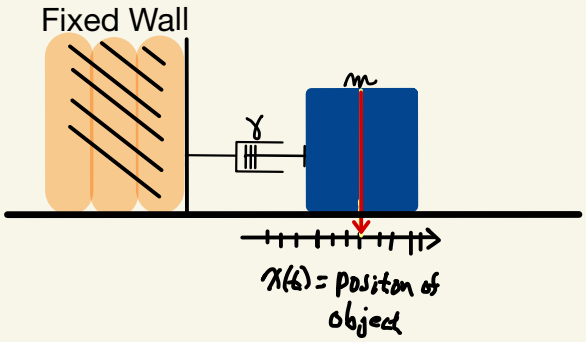
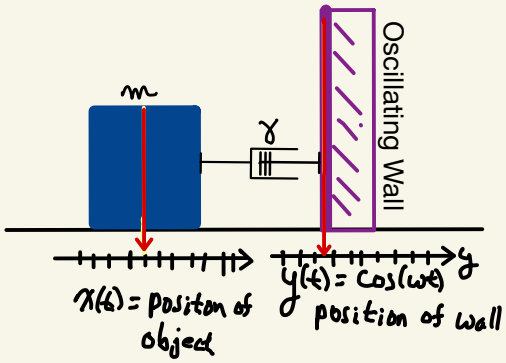
Lecture 27

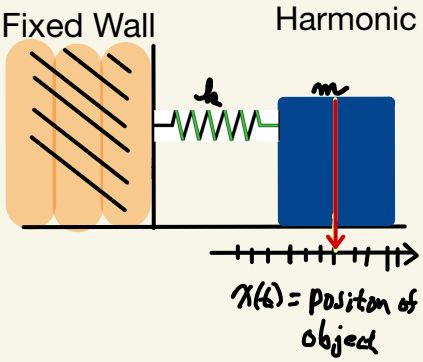
Modeling – Review mechanical systems

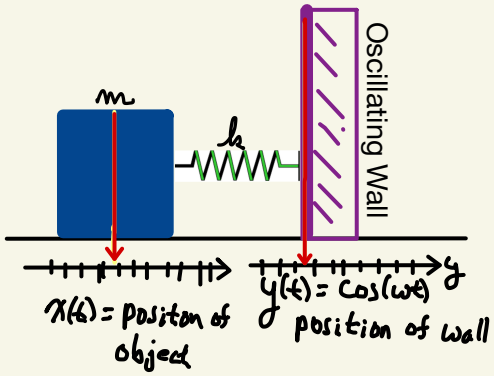
Model Mechanical Systems

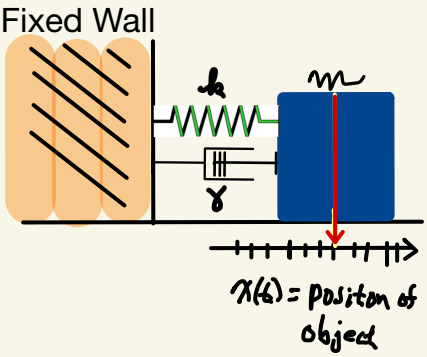


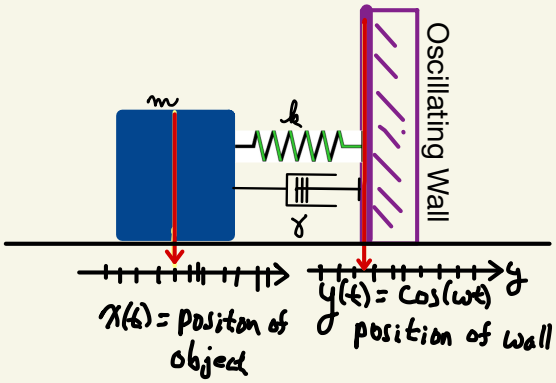


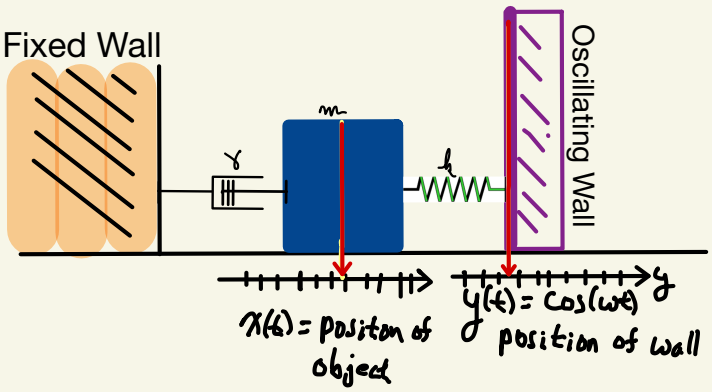
Driven Harmonic Oscillator

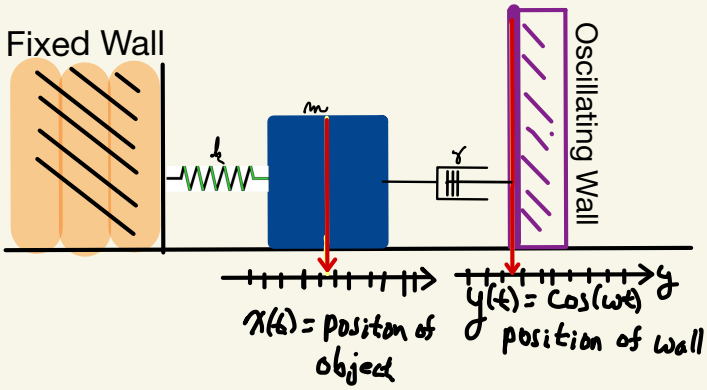


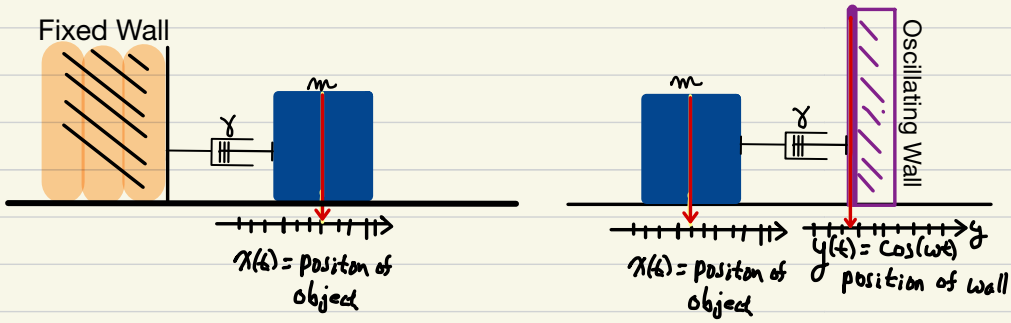












$$m x'' + \gamma x' = 0$$

$$m v' + \gamma v = 0$$

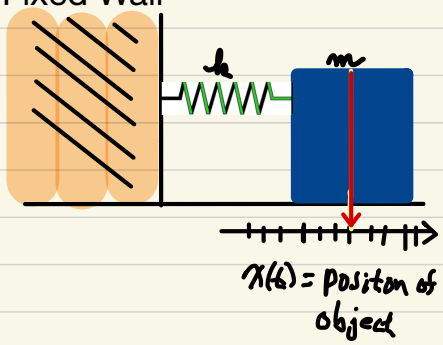
$$v = x'$$

$$m x'' + \gamma x' = \gamma y'(t)$$

$$m v' + \gamma v = \gamma y'(t)$$

Fixed Wall

Harmonic Oscillator

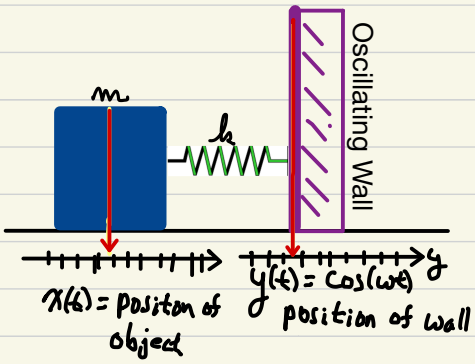


$$m x'' + k x = 0$$

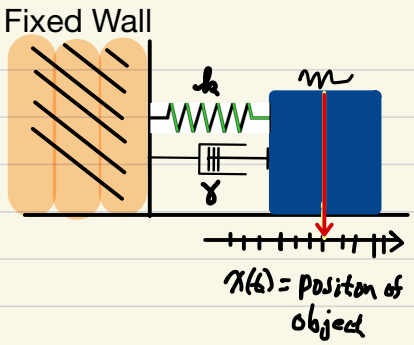
$$x'' + \omega_0^2 x = 0$$

$$\omega_0 = \sqrt{k/m}$$

Driven Harmonic Oscillator



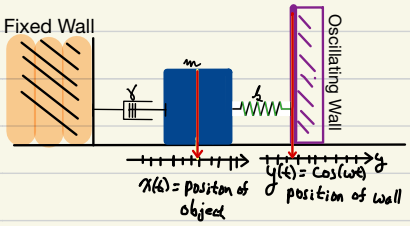
$$m x'' + k x = k y(t)$$

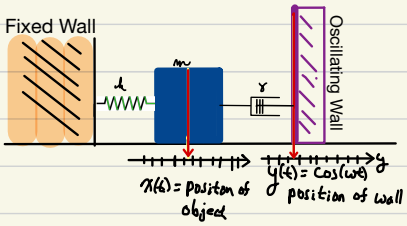


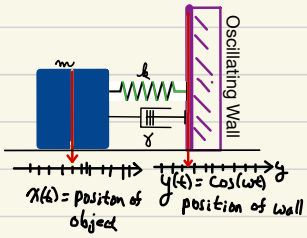
Damped Harmonic Oscillator

$$m\ddot{x} + \gamma\dot{x} + kx = 0$$

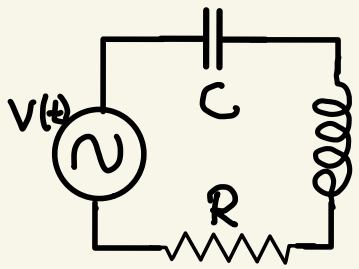
Other driving functions







Electrical Circuits



$$L\frac{dI}{dt} + RI + q/C = V(t)$$

$$I = \frac{dq}{dt},\ V_C = q/C$$

$$V_C'' + \frac{R}{L}V_C' + \frac{1}{LC}V_C = \frac{1}{LC}V(t)$$

$$I'' + \frac{R}{L}I' + \frac{1}{LC}I = \frac{1}{LC}V'(t)$$

Special cases: