

Classical Mechanics Assignment #1

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August 31, 2021

1. (a) Starting with the forces, simplifying, and substituting variables:

$$F_{\text{total}} = F_{\text{spring}} + F_{\text{damping}} + F_{\text{piston}}$$

$$m\ddot{x} = -kx - m\nu\dot{x} + kX(t)$$

$$\ddot{x} + \frac{k}{m}x + \nu\dot{x} = \frac{k}{m}(t)$$

$$\ddot{x} + \nu\dot{x} + \omega_0^2 x = F_0(t)$$

- (b) Complementary solution:

$$x(t) = e^{-\beta t} \left[A_1 e^{-i\sqrt{\omega_0^2 - \beta^2}t} + A_2 e^{i\sqrt{\omega_0^2 - \beta^2}t} \right]$$

Particular solution: