

Mass of mass 1	$m_1 := 1$	Mass of mass 2	$m_2 := 2$
Damping Coefficient damper 1	$c_1 := 0.2$	Damping Coefficient damper 3	$c_2 := 0.2$
Spring constant spring 1	$k_1 := 0.1$	Spring constant spring 3	$k_2 := 0.01$

Second-order differential equation to model the system behavior

$$m_1 \cdot x_1''(t) = -c_1 \cdot x_1'(t) - k_1 \cdot x_1(t) + k_2(x_2 - x_1) + c_2(x_2' - x_1')$$

$$m_2 \cdot x_2''(t) = -k_2(x_2 - x_1) - c_2(x_2' - x_1') + m_2 \cdot g$$

height mass 2  $h_1 := 2$

initial velocity mass 2  $v_0 := 0$

Gravity  $g := 9.81$

$$v_1^2 = v_0^2 + 2 \cdot g \cdot (h_1) \quad v_1 := \sqrt{2 \cdot g \cdot (h_1)} \quad v_1 = 6.264$$

$$\frac{d}{dt} x_1(t) = \frac{-c_1 \cdot x_1'(t) - k_1 \cdot x_1(t) + k_2(x_2 - x_1) + c_2(x_2' - x_1')}{m_1}$$

$$\frac{d}{dt} x_2(t) = \frac{-k_2(x_2 - x_1) - c_2(x_2' - x_1') + g}{m_2}$$

$$x_1(0) = 0 \quad x_1'(0) = 0$$

$$x_2(0) = 0 \quad x_2'(0) = 6.264$$

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} := \text{odesolve} \left( \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix}, 30 \right)$$