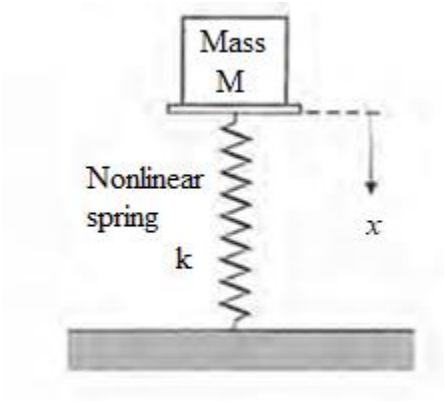
Mass Spring System

Consider the case of a mass, M, sitting on a nonlinear spring, as shown in Figure. The normal operating point is the equilibrium position that occurs when the spring force balances the gravitational force $F = mg$, where g is the gravitational constant. This non-linear spring acts as a linear system when we consider small deviations for this system. When we give a deflection, x, to the spring it will start oscillating. Since there is not any frictional force, this system will oscillate always (Assuming we are neglecting the air resistance for this system).

Create a Simulink Model for this mass spring system. Consider initial condition as $x(0) = 1$.



Equation-

$$m\frac{d^2x}{dt^2} + kx = F$$

Where,

$m = 20\ Kg,\ k = 10\ N/m$

Instructions for modelling-

1. While giving names to blocks, rename gains as **Gain1, Gain2, …from top to bottom** and Integrators as **Integrator1, Integrator2… from left to right**.

2. Use **only** calculated value for the gain blocks rather than assigning it to a variable.