

Example 1 A 16 lb object stretches a spring $\frac{8}{9}$ ft by itself. There is no damping and no external forces acting on the system. The spring is initially displaced 6 inches upwards from its equilibrium position and given an initial velocity of 1 ft/sec downward. Find the displacement at any time t , $u(t)$.

Example 2 Take the spring and mass system from the first example and attach a damper to it that will exert a force of 12 lbs when the velocity is 2 ft/s. Find the displacement at any time t , $u(t)$.

Example 3 Take the spring and mass system from the first example and this time let's attach a damper to it that will exert a force of 17 lbs when the velocity is 2 ft/s. Find the displacement at any time t , $u(t)$.

Example 4 Take the spring and mass system from the first example and for this example let's attach a damper to it that will exert a force of 5 lbs when the velocity is 2 ft/s. Find the displacement at any time t , $u(t)$.

Example 5 A 3 kg object is attached to spring and will stretch the spring 392 mm by itself. There is no damping in the system and a forcing function of the form $F(t) = 10 \cos(\omega t)$ is attached to the object and the system will experience resonance. If the object is initially displaced 20 cm downward from its equilibrium position and given a velocity of 10 cm/sec upward find the displacement at any time t .

Example 6 Take the system from the last example and add in a damper that will exert a force of 45 Newtons when then velocity is 50 cm/sec.