

Initial Energy = Final Energy

$$U_g = U_F + U_s$$

$$mgh = F_F l + \frac{1}{2}kx^2$$

$$L = d + x$$

$$h = \sin(t)f$$

$$F_F = m g \cos(t)f$$

$$M g \sin(t) (d+x) = m g \cos(t)f(d + x) + \frac{1}{2}kx^2$$

$$\frac{1}{2} kx^2 + mg(d+x)(\cos(t)f-\sin(t)) = 0$$

$$\frac{1}{2} kx^2 + mg(\cos(t)f-\sin(t))x +$$

$$dmg(\cos(t)f-\sin(t)) = 0$$

$$a = \frac{1}{2} kx^2$$

$$b = mg(\cos(t)f-\sin(t))$$

$$c = dmg(\cos(t)f-\sin(t))$$

$$x = (-b + \sqrt{b^2 - 4ac})/(2a)$$