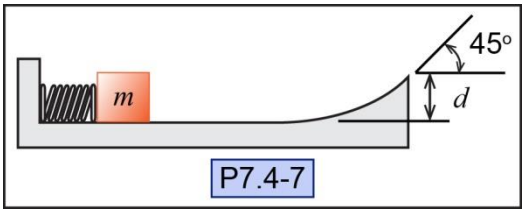
P7.4-7) A 5-kg block compresses a nonlinear spring a distance of 0.5 m, where the spring generates a force according to the equation $F_s = 2100x^2$ where x is in meters and F_s is in Newtons. If the block is released from rest and the height of the frictionless ramp is d = 1m, determine the velocity with which the block leaves the ramp and the maximum height reached by the block after it leaves the ramp. You may neglect air drag. If the ramp can no longer be considered frictionless, what further information would you need to solve this problem?



Given:

Find:

Solution:

Is this a conservative or non-conservative system?

Conservative Non-conservative

Label your states on the figure and specify where you zero potential energy state is.

Derive the equation for the potential energy of the nonlinear spring.

V_e = _____

Use the work-energy balance equation to calculate the speed of the block as it reaches the end of the ramp.

v = _____

Calculate the maximum height.

h = _____

If friction was included, is this a conservative or non-conservative system?

Conservative Non-conservative

What parameters would we need to know to calculate the work done by friction?