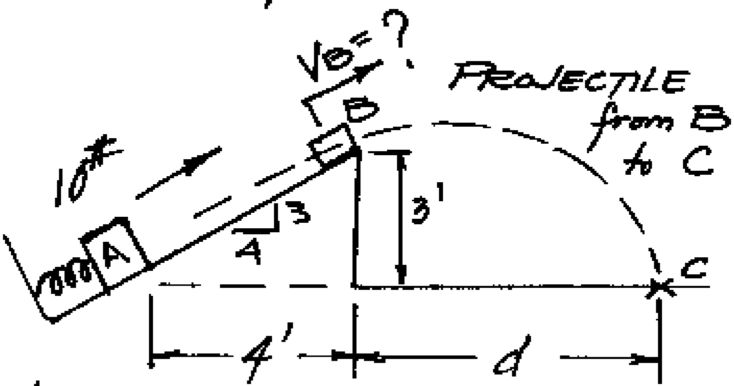
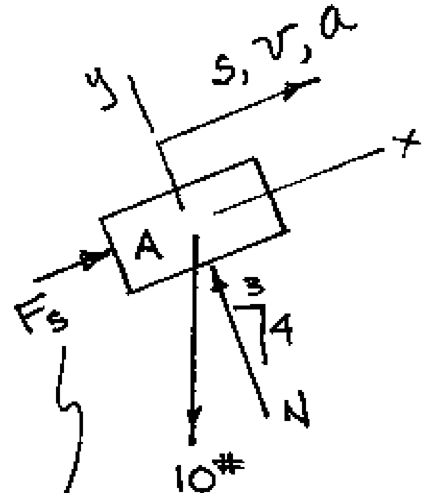
HIBBELER

$\boxed{14\text{-}29}$

WORK is using FORCE to move a mass a specified distance.





$k = 100\frac{lb}{ft}$ = SPRING CONSTANT $= \frac{\Delta F}{\Delta S}$

$$F_s = kx = \left(100\frac{lb}{ft}\right)(2ft) = 200\,lb.$$

DERIVED from NEWTON $\quad \Sigma F_{on\,mass_x} = m\ddot{x}$

$$+kx = m\ddot{x} = m\frac{dv}{dt} = m\frac{v\,dv}{dx}$$

$$\int kx\,dx = \int mv\,dv$$

$$\frac{1}{2}kx^2 = \frac{1}{2}mv^2 = KE \text{ for SPRING.}$$

$PE = (mg)h \Rightarrow 3'$ below pt. B $\therefore (10^{lb})(3') = 30\,ft\,lb.$

$$KE_{SPRING_i} = \frac{1}{2}\left(100\frac{lb}{ft}\right)(2ft)^2 = 200\,lb\,ft.$$

$$KE_{mass_f} = \frac{1}{2}mV_B^2 = \frac{1}{2}\,\frac{10^{\#}}{32.2}\,V_B^{\,2} = ?$$

$$-30\,ft.lb. = \frac{5}{32.2}V_B^2 - 200\,ft\,lb. \quad \therefore \boxed{V_B = 33.09\tfrac{f}{s}}$$

NOW ANALYZE THE PROJECTILE from pt. B.

HORIZONTAL

$$x = x_0 + v_0 t$$

$$d = 0 + \frac{4}{5}(33.09)t$$

VERTICAL

$$y = y_0 + v_0 t + \frac{1}{2}at^2$$

$$-3' = 0 + \frac{3}{5}(33.09)t - \frac{32.2}{2}t^2$$

$$t^2 - 1.233t - 0.186 = 0$$

$$\frac{-(-1.233) \pm \sqrt{(1.233)^2 - 4(-.186)}}{2}$$

$$t = 1.369\,s.$$

$$\therefore \boxed{d = 36.22\,ft}$$

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