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## 14–58.

The 50-lb block rests on the rough surface for which the coefficient of kinetic friction is  $\mu_k = 0.2$ . A force  $F = (40 + s^2)$  lb, where s is in ft, acts on the block in the direction shown. If the spring is originally unstretched (s = 0) and the block is at rest, determine the power developed by the force the instant the block has moved s = 1.5 ft.

## SOLUTION

+↑ ΣF<sub>y</sub> = 0; 
$$N_B - (40 + s^2) \sin 30^\circ - 50 = 0$$
  
 $N_B = 70 + 0.5s^2$   
 $T_1 + ΣU_{1-2} = T_2$   
 $0 + \int_0^{1.5} (40 + s^2) \cos 30^\circ ds - \frac{1}{2} (20)(1.5)^2 - 0.2 \int_0^{1.5} (70 + 0.5s^2) ds = \frac{1}{2} (\frac{50}{32.2}) v_2^2$   
 $0 + 52.936 - 22.5 - 21.1125 = 0.7764v_2^2$   
 $v_2 = 3.465$  ft/s  
When  $s = 1.5$  ft,

$$F = 40 + (1.5)^2 = 42.25 \, \text{lb}$$

$$P = \mathbf{F} \cdot \mathbf{v} = (42.25 \cos 30^{\circ})(3.465)$$

$$P = 126.79 \text{ ft} \cdot \text{lb/s} = 0.231 \text{ hp}$$

Ans.



