

24. The analysis of coordinates and forces (the free-body diagram) is exactly as in the textbook in Sample Problem 5-7 (see Fig. 5-18(b) and (c)).

(a) Constant velocity implies zero acceleration, so the “uphill” force must equal (in magnitude) the “downhill” force:  $T = mg \sin \theta$ . Thus, with  $m = 50$  kg and  $\theta = 8.0^\circ$ , the tension in the rope equals 68 N.

(b) With an uphill acceleration of  $0.10 \text{ m/s}^2$ , Newton’s second law (applied to the  $x$  axis shown in Fig. 5-18(b)) yields

$$T - mg \sin \theta = ma \implies T - (50)(9.8) \sin 8.0^\circ = (50)(0.10)$$

which leads to  $T = 73$  N.