

30. We apply Eq. 4-21, Eq. 4-22 and Eq. 4-23.

- (a) From  $\Delta x = v_{0x}t$ , we find  $v_{0x} = 40/2 = 20$  m/s.
- (b) From  $\Delta y = v_{0y}t - \frac{1}{2}gt^2$ , we find  $v_{0y} = (53 + \frac{1}{2}(9.8)(2)^2)/2 = 36$  m/s.
- (c) From  $v_y = v_{0y} - gt'$  with  $v_y = 0$  as the condition for maximum height, we obtain  $t' = 36/9.8 = 3.7$  s.  
During that time the  $x$ -motion is constant, so  $x' - x_0 = (20)(3.7) = 74$  m.