HW5-8 Soln)

Let up be positive. Use NII and examine the forces on the mass

$$+T - gm = ma_y$$

$$+T_{max} - gm = ma_{y\,max}$$

$$a_{y\,max} = \frac{T_{max} - gm}{m} = \frac{160 - 10(12)}{12} = 3.33\ m/s^2$$

The highest possible acceleration will result in the least possible time:

y_i = 0 m

y_f = +15 m

v_{yi} = 0 m/s

v_{yf} = ?

a_y = +3.33 m/s2

t = ? ←

(3)

$$y = y_i + v_{yi}t + \frac{1}{2}a_y t^2$$

Potentially quadratic, so insert values:

$$15 = 0 + 0 + \frac{1}{2}(3.33)t^2$$

$$t = \sqrt{\frac{2(15)}{3.33}} = 3.00\ seconds$$