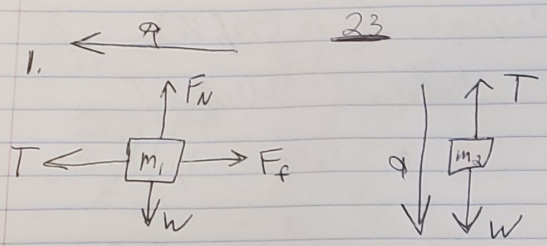
PHYS 407

23

1.



2. yes. They are attached by the same rope under the same tension

3. $\sum F_{m_2} = m_2 g - T = m_2 a$

$a_2 = \frac{W-T}{m_2}$ $\quad a = \frac{T - F_f}{m_1}$ $\quad \sum F_{m_1} = T - \mu F_N = m_1 a$

$W - T = m_2 a$ $\quad T - F_f = m_1 a$

$T = m_1 a + \mu F_N$

4. $W - T = m_2\left(\frac{T - F_f}{m_1}\right)$

$m_2 g - (m_1 a + \mu F_N) = m_2 a$

$\frac{m_2 g}{m_2} - \frac{m_1 a}{m_2} - \frac{\mu F_N}{m_2} = \frac{m_2 a}{m_2}$

$(m_1 g)$ $\quad +m_1 a$

$m_2 g - \mu F_N = m_2 a + m_1 a$

$m_2 g - \mu m_1 g = m_2 a + m_1 a$

$\frac{g(m_2 - \mu m_1)}{m_1 + m_2} = \frac{a(m_1 + m_2)}{m_1 + m_2}$

$$a = \frac{g(m_2 - m_1\mu)}{m_2 + m_1}$$

5. $a = \frac{g(3m_2 - m_1)}{3m_2 + m_1}$

$3m_2 g - \mu m_1 g = 3m_2 a + m_1 a$

$3m_2 g - 3m_2 a = m_1 a + \mu m_1 g$

$3(m_2 g - m_2 a) = m_1 a + \mu m_1 g$

$3m_2(g - a) = m_1(a + \mu g)$

$\frac{3m_2}{m_1} = \left(\frac{a + \mu g}{g - a}\right)$

$a = \frac{F}{m}$ $\quad 1 = \frac{1}{1}$ $\quad 1/3 = \frac{1}{3}$

acceleration can increase indefinetly

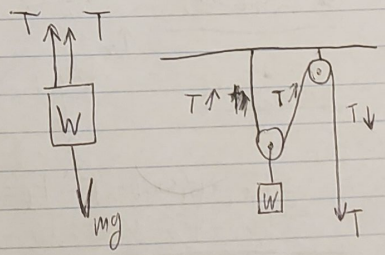
this is wrong

6. $a = \frac{g(3m_2 - m_1)}{3m_2 + m_1}$

as $m_2 \to \infty$,

$\frac{g(m_2 - m_1)}{m_2 + m_1} \to 9.8\ m/s^2$

7.



8. when T pulls on the rope, 2T pulls on the pully that has the weight attached

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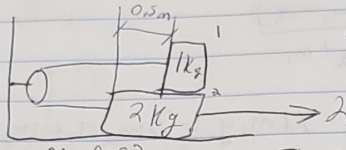
9.



$m_1 = 1kg$

$m_2 = 2kg$

$20N = T$

$20 = 9.8 + 8.82$ $F_{f_{m_1,m_2}} = T = a_1 m$

$\mu = 0.3$

$\Sigma F_{y_1} = F_{N_1} - m_1 g = m$

$\Sigma F_{x_1} = F_{f_{m_1,m}} - T = m_1 a(-a)$

$\Sigma F_{y_2} = F_{N_2} - F_{N_1} - m_2 g = m$

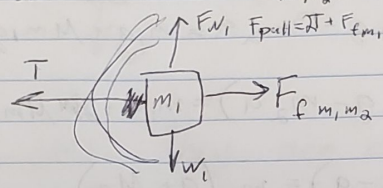
$\Sigma F_{x_2} = F_P - T - F_{f_{m_1,m_2}} - F_{f_{m_2 S}} = m_2 a$

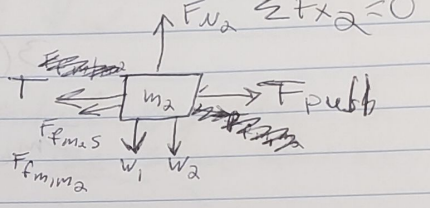
$\Sigma F_{y_1} = 0$

$\Sigma F_{x_1} = 0$

$\Sigma F_{y_2} = 0$

$\Sigma F_{x_2} = 0$





$F_{N_1} = W_1 = 9.8N$

$F_{f_{m_1,m_2}} = 0.3 F_N = 2.94N$

$\frac{T - 2.94}{1} = a = 17.64$

$F_{N_2} = W_1 + W_2 = 29.4N$

$F_{f_{m_1,m_2}} = 2.94N$

$F_{f_{m_2 S}} = 0.3 F_{N_2} = 8.82$

$2.94 + 8.82 = 11.76N$

$\frac{T - 11.76}{3} = a = 2.75\ m/s^2$

$x_f = \frac{1}{2}at^2 + v_i t + x_i$

$0.5 = \frac{1}{2} 2.75 t^2$

1.375

$t = 0.53$ seconds

$1.77 = a_x = \frac{T}{m_1 + m_2}$

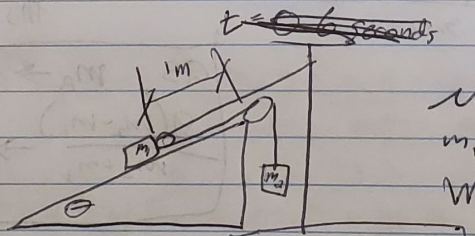
$T = 0.53 \times 3$ seconds

$F_{pull} - 3m_1 g = m_1 + m_2$

$-10.13 m/s^2 = \frac{2a}{2} = W_1 \sin 20 - 2$

$W_2 - (W_1 \cos 20°) 0.4$

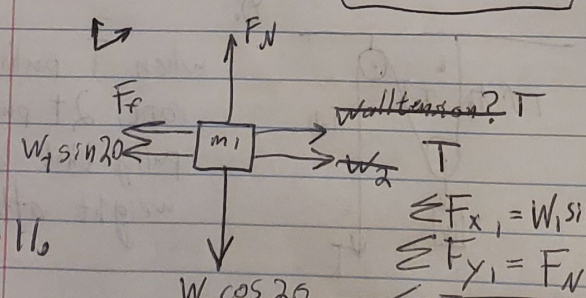
10.



$\mu = 0.4$ $\theta = 20°$

$m_1 = 2kg$ $m_2 = 1kg$

$W_1 = 19.6N$ $W_2 = 9.8N$



$\Sigma F_{x_1} = W_1 \sin 20 - 2T - F_f = m_1 a_x$

$\Sigma F_{y_1} = F_N - W_1 \cos 20 = m_1 0$

$\Sigma F_{y_2} = T - W_2$

11.