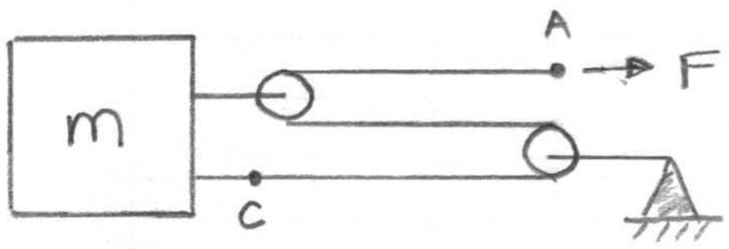
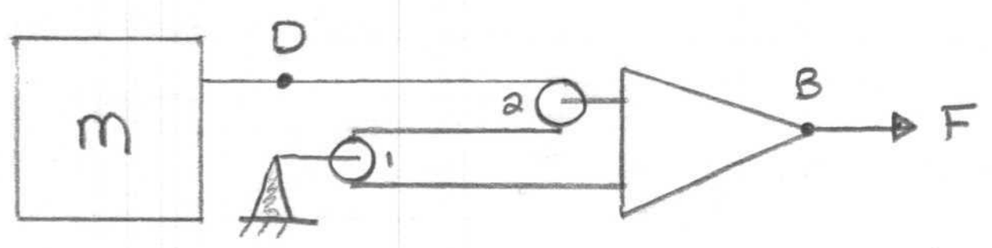
TAM 203
Homework Solutions

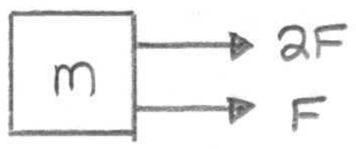
Due 4/3/08

12.8



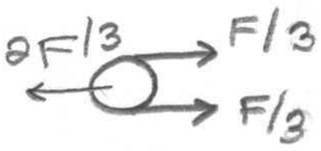


FBD of mass:

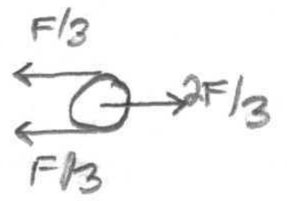


$\therefore \ddot{x}_C = \frac{3F}{m}$

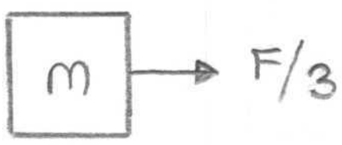
FBD of pulley 1:



FBD of pulley 2:



FBD of mass:



$\therefore \ddot{x}_D = \frac{F}{3m}$

We know $\ddot{x}_A = 3\ddot{x}_C$ and $\ddot{x}_B = \frac{1}{3}\ddot{x}_D$

$\therefore \ddot{x}_A = 3\left(\frac{3F}{m}\right) = \frac{9F}{m}$ and $\ddot{x}_B = \frac{1}{3}\left(\frac{F}{3m}\right) = \frac{F}{9m}$

$\therefore \frac{a_A}{a_B} = \frac{\ddot{x}_A}{\ddot{x}_B} = \frac{\frac{9F}{m}}{\frac{F}{9m}} = \boxed{81}$