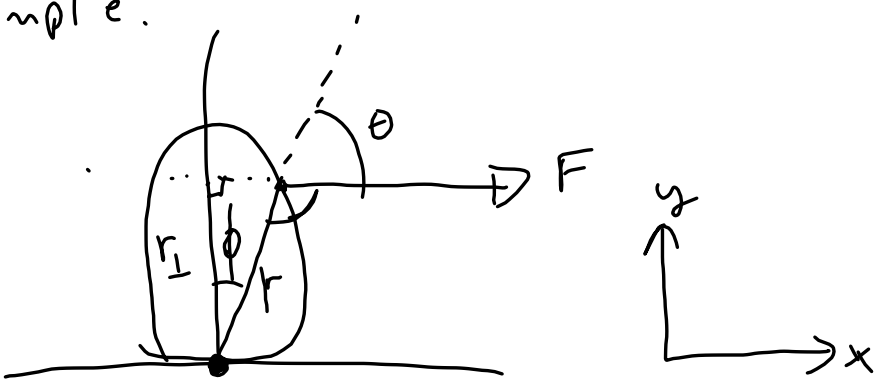
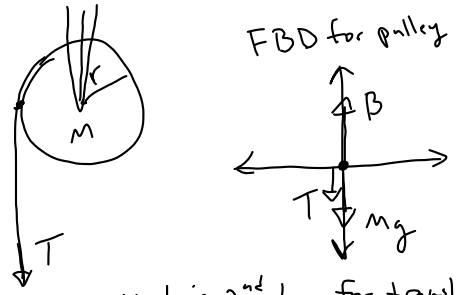
Example:



$r_\perp = r\cos\phi = r\sin\theta$

$\vec{\tau} = \vec{r} \times \vec{F} = rF\sin\theta$ (negative z direction)

Oct 31-9:54 AM



FBD for pulley

Newton's 2nd law for translation

$\Sigma F_x = ma_x = 0$ $\Sigma F_y = ma_y = 0$

$B - T - mg = 0$

$B = T + mg$

$B = 10N + 9.8N$

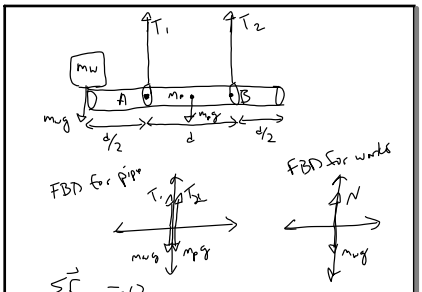
$B = 19.8\ N$

For torque

axis of rotation, so τ due to B and mg is zero

$\vec{\tau} = rT$ (positive)

Oct 31-10:09 AM



$\Sigma \vec{F}_y = 0$

$T_1 + T_2 = (m_w + m_p)g$

$\Sigma \vec{\tau} = 0$

For torque about point A

$dT_2 - \frac{d}{2} m_p g + \frac{d}{2} m_w g = 0$

$T_2 = \frac{g}{2}(m_p - m_w)$

For torque about point B

$\frac{3d}{2} m_w g - dT_1 + \frac{d}{2} m_p g = 0$

$T_1 = \frac{g}{2}(m_p + 3m_w)$

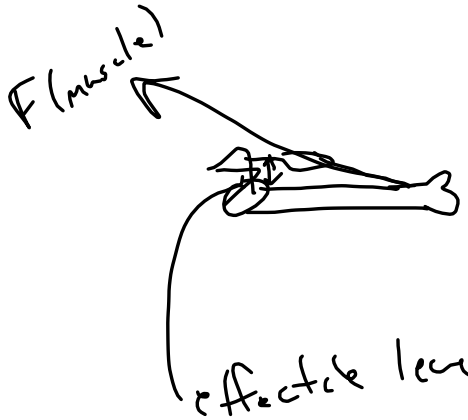
$T_1 + T_2 = m_p g + m_w g$

as expected

Oct 31-10:22 AM

For problem #4 in ETA

An "effective" lever arm for a muscle



Oct 31-10:41 AM