ENGR 214: Dynamics  
Spring 2009  
Assignment 2 (due 4/3/2009)

1. Three blocks $m_1$, $m_2$ and $m_3$ are positioned as shown and a force $F$ is applied on $m_1$. If the coefficient of friction between any two surfaces is $\mu$, determine:
   a) the maximum force $F$ which can be applied without $m_2$ slipping over $m_1$.  
   b) the contact force between $m_1$ and $m_3$.

2. Disc A rotates in a horizontal plane about a vertical axis at a constant angular velocity $\dot{\theta}_0 = 15$ rad/s. Slider B has a mass of 230 g and moves in a frictionless slot cut in the disc. The slider is attached to a spring of constant 60 N/m, which is undeformed when $r=0$. Knowing that at a given instant the acceleration of the slider relative to the disc $\ddot{r} = -12$ m/s and that the horizontal force exerted on the slider by the disc is 9 N, determine at that instant:
   (a) the distance $r$  
   (b) the radial component of the velocity of the slider

3. Determine the constant speed of the passengers on the amusement-park ride if it is observed that the supporting cables are directed at $\theta=30^\circ$ from the vertical as shown. Each chair including its passengers has a mass of 80 kg. Also, what are the force components along the $n$, $t$, and $b$ directions which the chair exerts on a 50-kg passenger during the motion?

4. If the coefficient of friction between the 20-kg block A and the 100-kg block B is 0.5, determine the acceleration of each block for
   (a) $P = 60$ N  
   (b) $P = 40$ N