Problem 1. (10 points)
At the instant shown, bar $AB$ has a constant angular velocity of 19 rad/s clockwise. Find (a) the angular acceleration of bar $BDG$, and (b) the acceleration of bar $DE$.

Problem 2. (10 points)
The extremities of the rod $AB$, weighing 50 lbs, can move freely (with no friction) along the smooth surfaces as shown. If the rod is released from rest from the position shown, determine (a) the angular acceleration of the rod, and (b) the reaction forces on the rod at $A$ and $B$.
For the rod, $I_C = ml^2/12$, where all symbols have their usual meanings.
Problem 3. (8 points)
The 9 kg rod $AB$ is attached by pins to two 6 kg uniform disks as shown. The assembly rolls without sliding on a horizontal surface. If the assembly is released from rest when $\theta = 60 \ degrees$, determine the angular velocity of the disks when $\theta = 180 \ degrees$.

The mass moments of inertia of a rod and a disk about their respective center of masses are given by the expressions $I_{rod} = ml^2/12$ and $I_{disk} = mr^2/2$, where all symbols have their usual meanings.

Problem 4. (7 points)
The train shown is traveling at a speed of 54 km/hr when brakes are applied on the wheels of cars $B$ and $C$, causing them to slide on the track, but are not applied to the wheels of car $A$. Knowing that the coefficient of kinetic friction between the wheels and track is 0.35, determine (a) the distance required to bring the train to a complete stop, and (b) the force in the coupling between cars $A$ and $B$. 

54 km/hr 

$A 35 \text{ Mg}$ $B 45 \text{ Mg}$ $C 35 \text{ Mg}$