1. Determine the banking angle θ for the vehicle in Fig. 1 so that the wheels of the vehicle will not have to depend upon friction to prevent any vehicle from sliding. Assume that vehicles have negligible size, a mass of m, and traveling around a curve of radius r with a constant speed v. (30%)

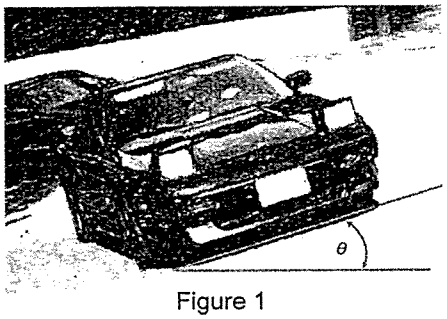

Figure 1

2. In Figure 2 a bicycle and rider have a mass of 80 kg with center of mass located at G. If the coefficient of kinetic friction at the rear tire is $\mu_B = 0.8$, determine the normal reactions at the tires A and B, and the deceleration of the rider, when the rear wheel locks for breaking. What is the normal reaction at the rear wheel when the bicycle is traveling at constant velocity and the brakes are not applied? Neglect the mass of the wheels. (40%)

Figure 2

3. In Figure 3, a jet plane has a mass of 250 Mg and a horizontal velocity of 100 m/s when $t = 0$. If both engines provide a horizontal thrust which varies as shown in the graph, determine the plane's velocity in $t = 15$ s. Neglect air resistance and the loss of fuel during the motion. (30%)

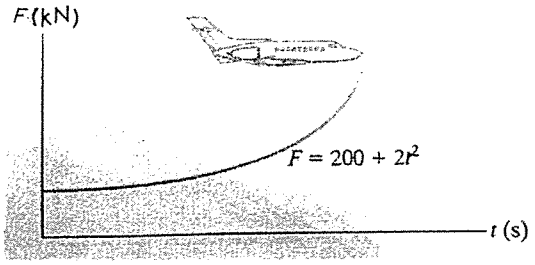

Figure 3

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