Problem Set 2
Due January 28, 1999

Professors Gray & Costanzo   Spring 1999

Problem 1

Gary Anderson of the Minnesota Vikings needs to make a kick with 2:07 left in regulation to put the Vikes up by 10—a lead that Atlanta will be hard pressed to overcome. He is 38 yards from the goal posts. Assuming he is right in the middle of the field and that you can neglect air resistance, what can the initial speed and initial trajectory (*i.e.*, direction of motion) be so that his kick gives the Vikings a sure win? That is, carefully define a range of velocities and angles. In the NFL, the cross bar on each goal post is 10 ft above the ground and the posts are $18'6''$ wide.

Go Vikes!

Problem 2

The 3000 lb car shown on the right is driving down an incline, the angle of which is θ with the horizontal, when the driver locks up the wheels in a panic stop. If the coefficient of kinetic friction between the tires and the pavement is 0.7, how far will the car skid before coming to a stop if its initial speed is 45 mph? Give your answer as a function of θ. Using Mathematica, plot the stopping distance versus the angle θ. Explain physically why the plot is shaped the way that it is.
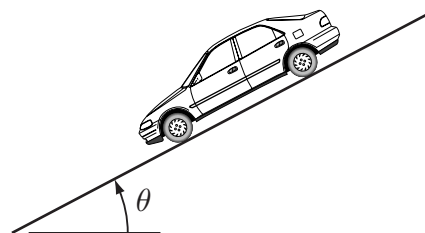
Problem 3

Do Problem 12.19 in your text. In addition, for Part (a) do a 3D plot in Mathematica which shows the velocity of the slider C as a function of θ and $\dot{\theta}$. That is, simply plot the equation you obtain in Part (a).