A punter during a football game when he punts the ball does the following: he drops the ball straight down from a height of 5 feet, when the ball is 2 feet above the ground he kicks it with enough force so that the resultant velocity has magnitude of 100 feet per second, and the direction of the football immediately after the kick is at an angle of $30^\circ$ with the ground. Assume that the mass of the football is $\frac{1}{15}$ slugs, and the gravitational force of acceleration is 32 feet per second per second. I encourage you to use Maple as much as you can.

1. (5) Model this problem with a two dimensional system of second order differential equations. Let $x$ represent the horizontal displacement of the football and let $y$ represent the vertical displacement. Thus, $y(0) = 5$ and $x(0) = 0$. Be sure to use the Dirac $\delta$ function in your system. Hint, you will need to first determine how long it takes the ball to fall 3 feet. Call this time $t_1$.

2. (2) How long after the kick before the ball hits the ground?

3. (2) What is the maximum height of the ball?

4. (1) What is the magnitude of the force applied to the football by the kick?