Math 341 Homework # 5
Due Wednesday Oct. 9 in class.

Section 3.1 1,5,6,9,15,17,19,23,29,31,34,40,43

Section 3.2 # 7,13,15,17,19,23,24

Problem: Coyote Physics

(a) Wile E. Coyote has a pair of rocket shoes, which produce a force proportional to his velocity, with proportionality constant 5. Unknown to Wile his suspenders are caught on a branch. The suspenders are elastic, and obey Hooke's law, producing a restoring force proportional to his displacement (with proportionality constant 6.) Assuming that the coyote has mass $m = 1$, in appropriate units, show that his equation of motion is

$$\frac{d^2x}{dt^2} = 5\frac{dx}{dt} + 6x$$

(b) Find the general solution to the above.

(c) Suppose that the coyote is initially at $x = 1$, and is initially travelling with velocity $\frac{dx}{dt}(0) = 1$ (Having just fired himself from a catapult). Find the solution giving Coyote's position as a function of time.

(d) Suppose that Road Runner is eating a heap of birdseed, piled at $x = 5/4$. Does Wile E reach the road runner before the suspenders pull him back?

(e) Find the minimum initial velocity which is necessary for the Coyote to catch Road Runner.