Math 2551 Worksheet Section 13.2

1. Suppose that $\vec{r}(t)$ satisfies

$$\vec{r}''(t) = -\hat{i} - \hat{j} - \hat{k}, \quad t \geq 0, \qquad \vec{r}'(0) = 5\hat{i}, \qquad \vec{r}(0) = 10\hat{i} + 10\hat{j} + 10\hat{k}.$$

Find $\vec{r}(t)$.

2. A baseball is hit when it is 2.5 ft above the ground. It leaves the bat with an initial velocity of 140 ft/sec at a launch angle of 30°. At the instant the ball is hit, an instantaneous gust of wind blows against the ball, adding a component of $-14\hat{i}$ (ft/sec) to the ball's initial velocity. A 15 ft high fence lies 400 ft from the home plate in the direction of the flight. (Note that gravity, g = 32 ft/sec^2)

   (a) Include an appropriate sketch.

   (b) Find a vector equation for the path of the baseball.

   (c) How high does the baseball go, and when does it reach maximum height?

   (d) Find the range and flight time of the baseball, assuming that the ball is not caught.

   (e) When is the baseball 20 ft high? How far (ground distance) is the baseball from home plate at that height?

   (f) Has the batter hit a home run? Explain.