

Problem 31

A more realistic model (than that in Problem 30) of a baseball in flight includes the effect of air resistance. In this case the equations of motion are

$$dv/dt = -rv, \quad dw/dt = -g - rw,$$

where r is the coefficient of resistance.

- (a) Determine $v(t)$ and $w(t)$ in terms of initial speed u and initial angle of elevation A .
- (b) Find $x(t)$ and $y(t)$ if $x(0) = 0$ and $y(0) = h$.
- (c) Plot the trajectory of the ball for $r = 1/5$, $u = 125$, $h = 3$, and for several values of A . How do the trajectories differ from those in **Problem 31** with $r = 0$?
- (d) Assuming that $r = 1/5$ and $h = 3$, find the minimum initial velocity u and the optimal angle A for which the ball will clear a wall that is 350 ft distant and 10 ft high. Compare this result with that in Problem 30(f).

[**TYPO: r , h , and u should be written as $r = 1/5 \text{ s}^{-1}$, $u = 125 \text{ ft/s}$, and $h = 3 \text{ ft}$. Also, **Problem 31** needs to be changed to **Problem 30**.]**