

Problem 25

A body of constant mass m is projected vertically upward with an initial velocity v_0 in a medium offering a resistance $k|v|$, where k is a constant. Neglect changes in the gravitational force.

- (a) Find the maximum height x_m attained by the body and the time t_m at which this maximum height is reached.
- (b) Show that if $kv_0/mg < 1$, then t_m and x_m can be expressed as

$$t_m = \frac{v_0}{g} \left[1 - \frac{1}{2} \frac{kv_0}{mg} + \frac{1}{3} \left(\frac{kv_0}{mg} \right)^2 - \dots \right],$$
$$x_m = \frac{v_0^2}{2g} \left[1 - \frac{2}{3} \frac{kv_0}{mg} + \frac{1}{2} \left(\frac{kv_0}{mg} \right)^2 - \dots \right].$$

- (c) Show that the quantity kv_0/mg is dimensionless.