1.16 (10) , 1.21(10)**

**P1.1 Kinematics of a Vertical Jump (10 points)**

An athlete jumps vertically from rest, to a maximum height $h = 80\text{cm}$. (In the following we treat the jumper as a point particle). Calculate:

(a) the total time of flight of the jump.
(b) the fraction of the total time of flight in the highest 15\text{cm}.
(c) the fraction of the total time of flight in the lowest 15\text{cm}.

**P1.2 Ant Trajectories (10 points, plus 5 extra credit points for the shortest correct solution to P1.2(c))**

Three ants on the floor are initially at the vertices of an equilateral triangle, of length $d = 20\text{cm}$ on a side. Each ant moves towards it’s “counterclockwise” nearest neighbor at a constant speed $v_a = 1.0\text{cm/sec}$. (Thus ant 1 chases ant 2 who chases ant 3 who chases ant 1.) Each ant adjusts its motion so it is always moving exactly towards its neighbor.

(a) Do the ants ever meet? If so how long does it take for them to meet.
(b) What is the total distance that each ant moves.
(c) Give an analytic expression for the path of each ant.