Mathematics Year 1, Calculus and Applications I

Challenge Problem 1

This is the *dog chasing rabbit* problem, one of a suite of pursuit problems that are very interesting especially now in the world of drones and automation.

Here is the problem: A rabbit moves along the $x-$axis with constant speed α, and a dog chases the rabbit with constant speed β (i.e. the *magnitude* of the dog's velocity is β, but the direction changes of course). The rabbit starts at time $t = 0$ at the origin $(0, 0)$ and the dog starts h units above the rabbit from the point $(0, h)$. Find the trajectory described by the dog in its pursuit of the rabbit. [You should assume that the dog's chasing strategy is to always instantaneously align its direction of travel along the line joining her position with the rabbit's.]