6a)
First of all we need to obtain the different equations that describe the movement of both objects. The drone is quite trivial while the one for Bob is one for a thrown object under the influence of gravity. These are the following:

$$x(t) = v_0 \cdot cos(\theta) \cdot t \tag{1}$$
$$y(t) = v_0 \cdot sin(\theta) \cdot t - \frac{g}{2} \cdot t^2 \tag{2}$$
$$x_d(t) = v_d \cdot (t + t_0) \tag{3}$$
$$y_d(t) = y_0 \tag{4}$$

We can now set (1) equal to (3) and (2) to (4) solve one of them for t and substitute it in the other equation.

$$x(t) = x_d(t) \quad \Rightarrow t = -\frac{v_d \cdot t_0}{v_d - v_0 \cdot cos(\theta)} \tag{5}$$
$$y(t) = y_d(t) \quad \Rightarrow -v_0 \cdot sin(\theta) \cdot t + \frac{g}{2} \cdot t^2 + y_d = 0 \tag{6}$$
$$\Rightarrow v_0 \cdot sin(\theta)\frac{v_d \cdot t_0}{v_d - v_0 \cdot cos(\theta)} + \frac{g}{2} \cdot (\frac{v_d \cdot t_0}{v_d - v_0 \cdot cos(\theta)})^2 + y_d = 0 \tag{7}$$

Using this equation and the Newton-Raphson method we can now determine a possible angle θ numerically. The program I've written uses equation (7) and determines a zero point for it.

6b)
Using the values given the program approximates the zero point up to 10^{-12} and prints the value of the function and the current angle at every step. From trial an error I found that 100 iterations are more than enough so I use that as a limit for the iterations. Lastly it outputs the final angle it reached. The calculated solution is 27.782949 degrees.

6c)
Using the same method as before I now vary t_0 in an attempt to see when the algorithm finds feasible solutions. I do this from 0s to 5s in 0.01s steps and discard all solutions that do not fall between 0° and 90° since those don't make sense and any that do not reach a solution after 100 iterations.
Looking at the resulting dataset we can see that the time window is between 0.32s and 2.85s and Bob needs to throw in angles between 26° and 39°.
This can be visualized using a plot: