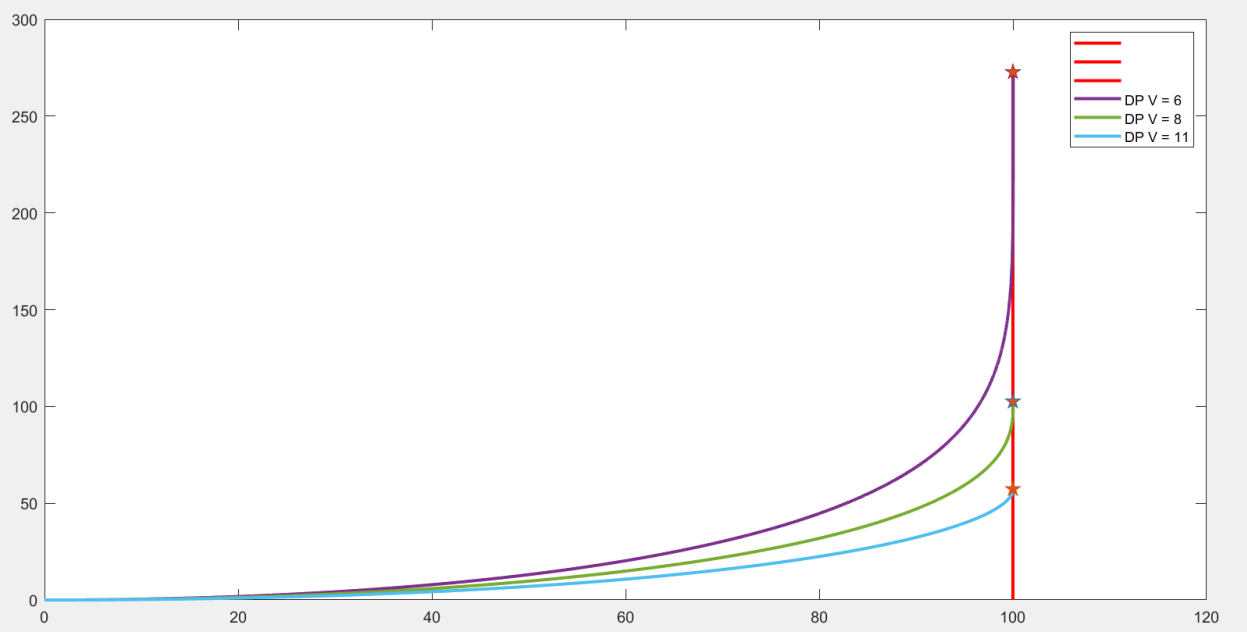
Homework 5

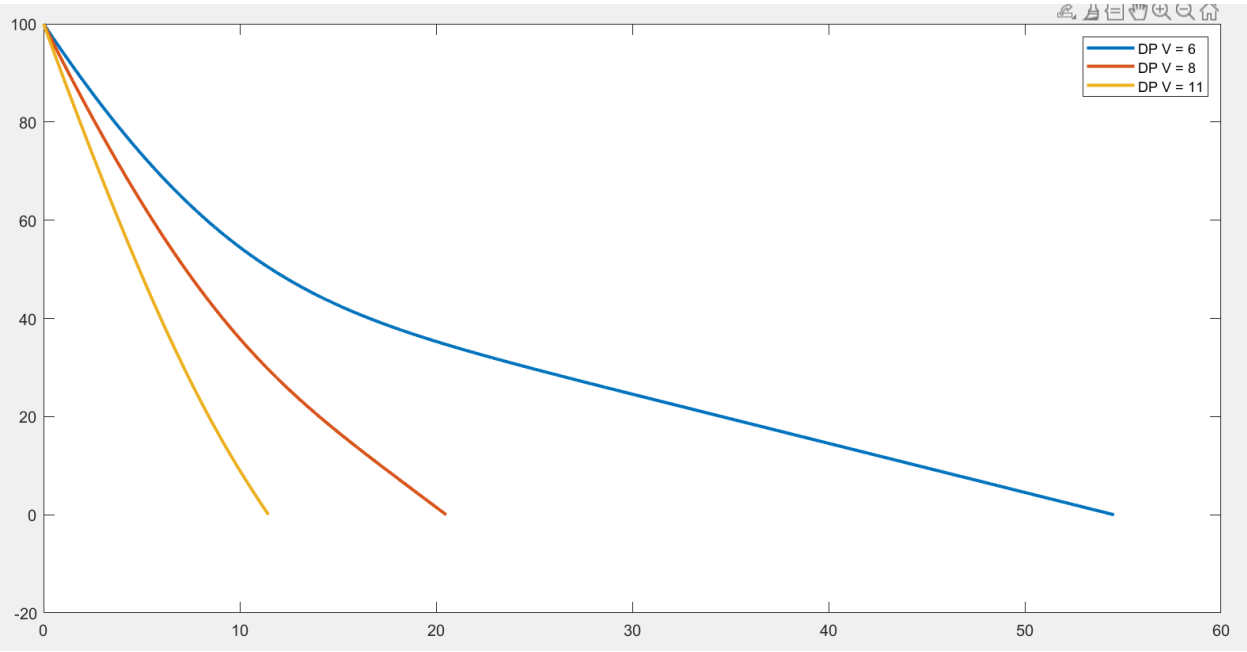
Question 1:

As the velocity increases, the missile takes down the target faster

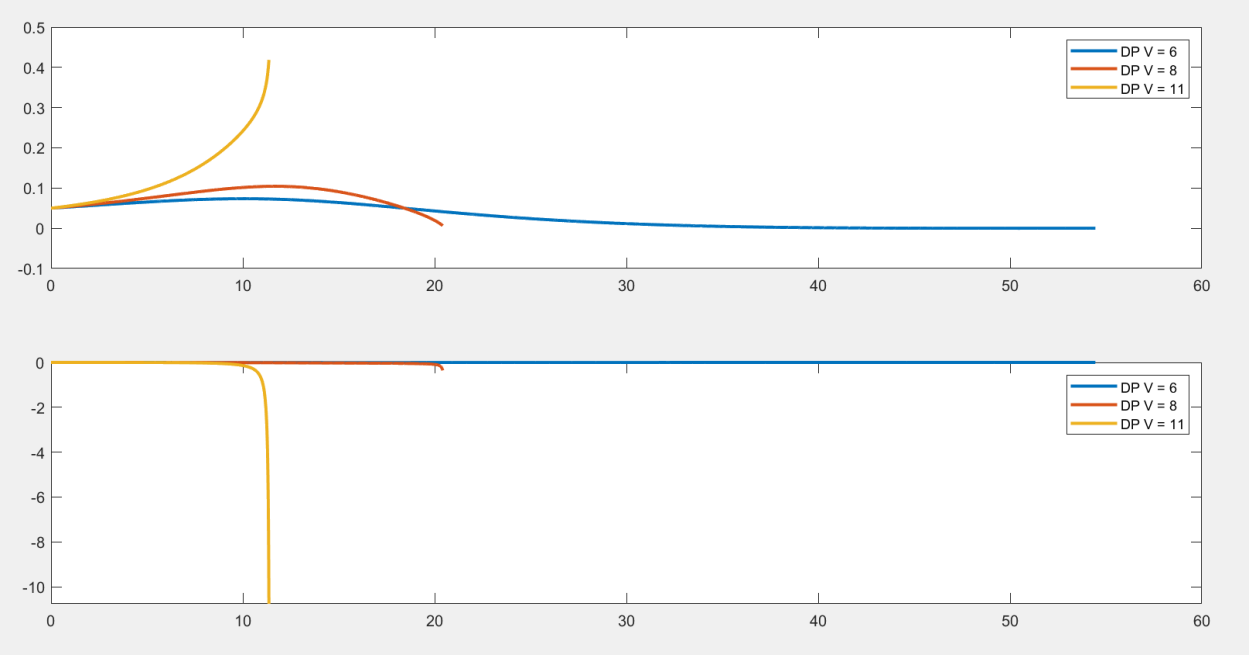
- Trajectories



- Range plots

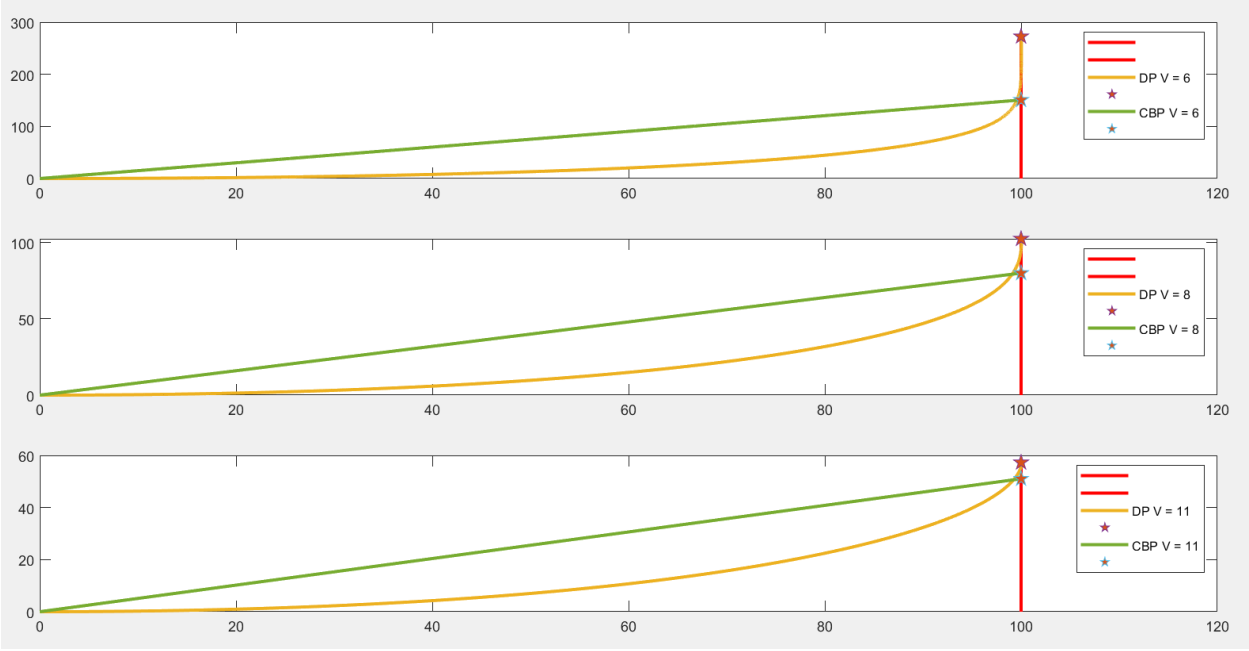


- beta_dot and beta_ddot



Question 2:

As the velocity increases, the time gap between the CBP and DP will decrease



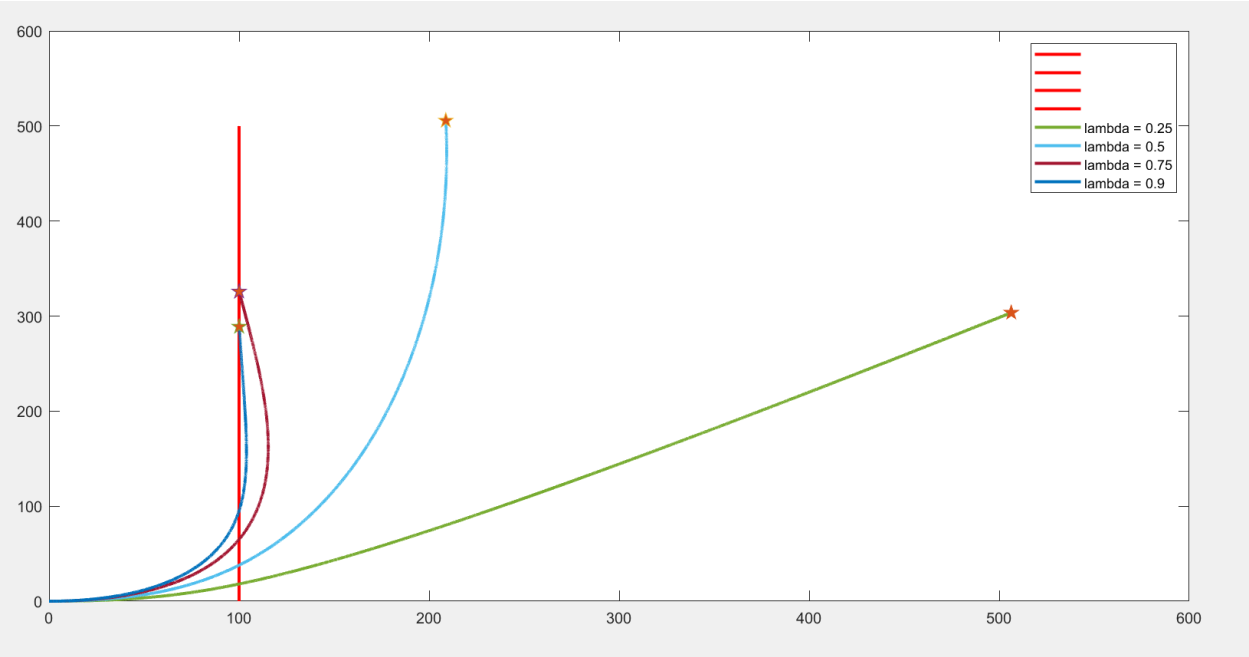
Question 3:

For lambda<1, as the lambda is small it overshoots, this is because the system is reacting slow to the stimulus(sensor observation), so the delay is getting induced and the system is overshooting. As the lambda approaches 1 it is back to direct pursuit mode and the overshooting decreases.

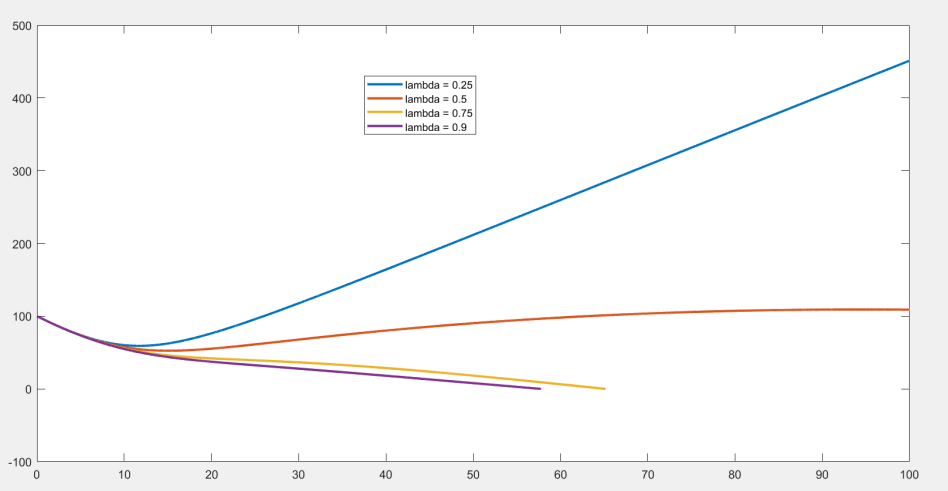
If we keep increasing the lambda (>1), then it will slowly go close to CBP. And the overshoot decreases and it will undershoot as lambda increases more. This case may not be good if there is any sudden motion in the target at the last minute.

lambda<1 case:

- Trajectory

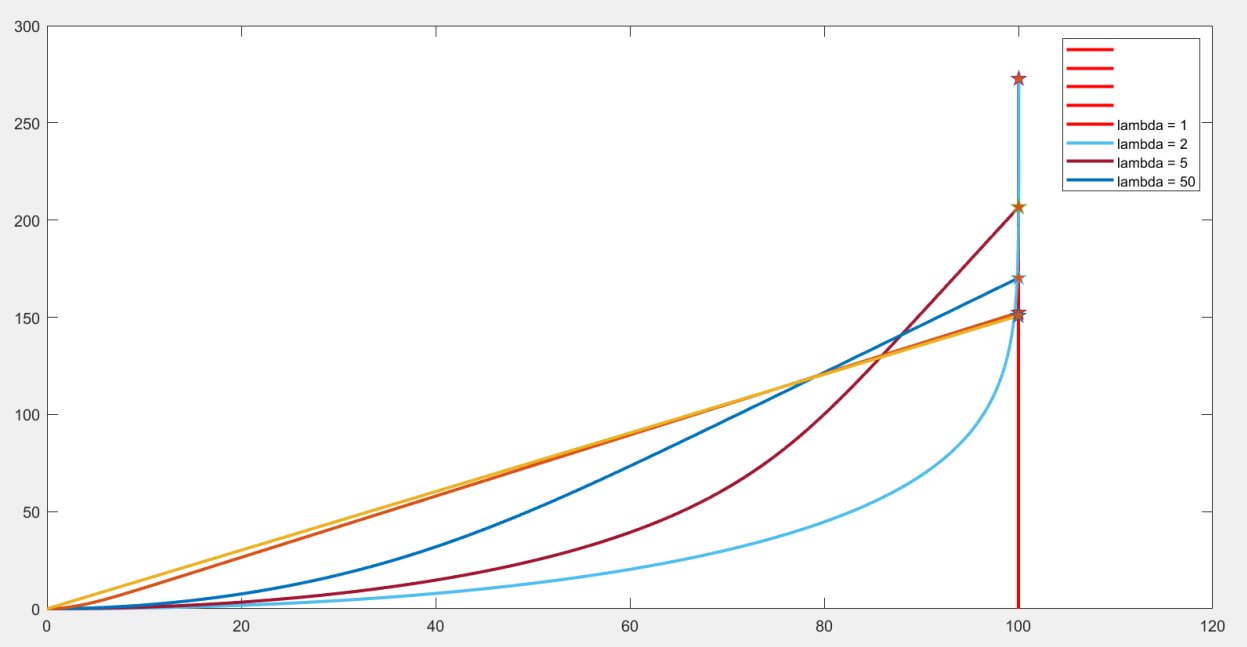


- Range plots

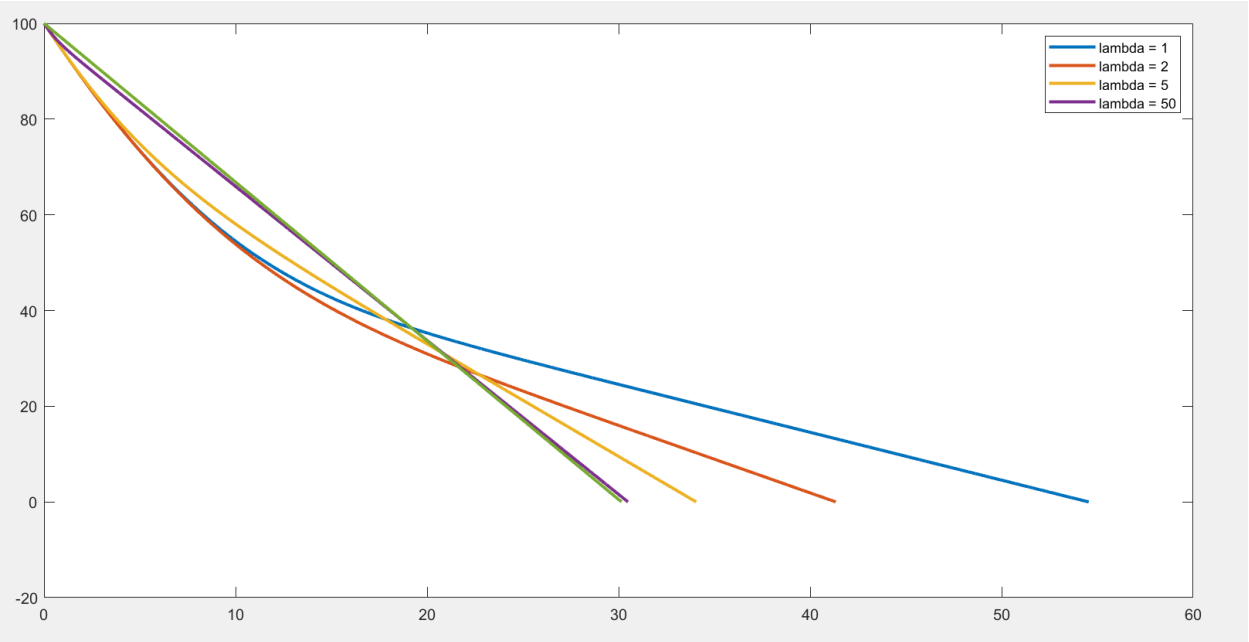


For lambda>1

- Trajectory



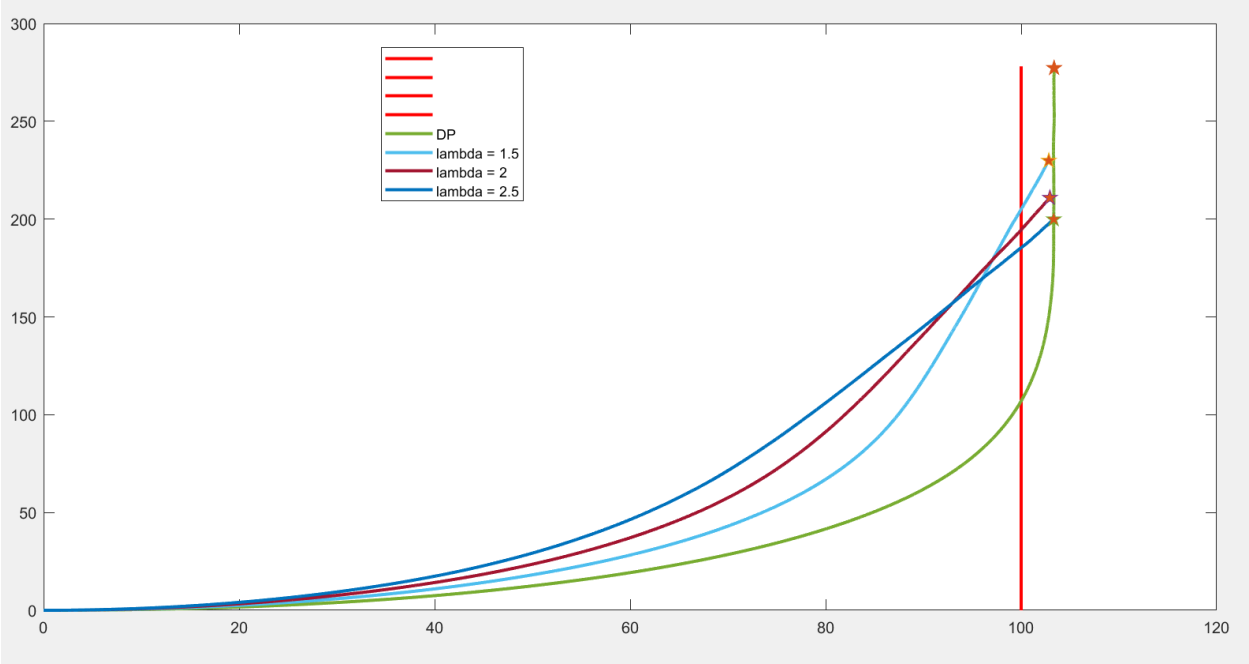
- Range Plots



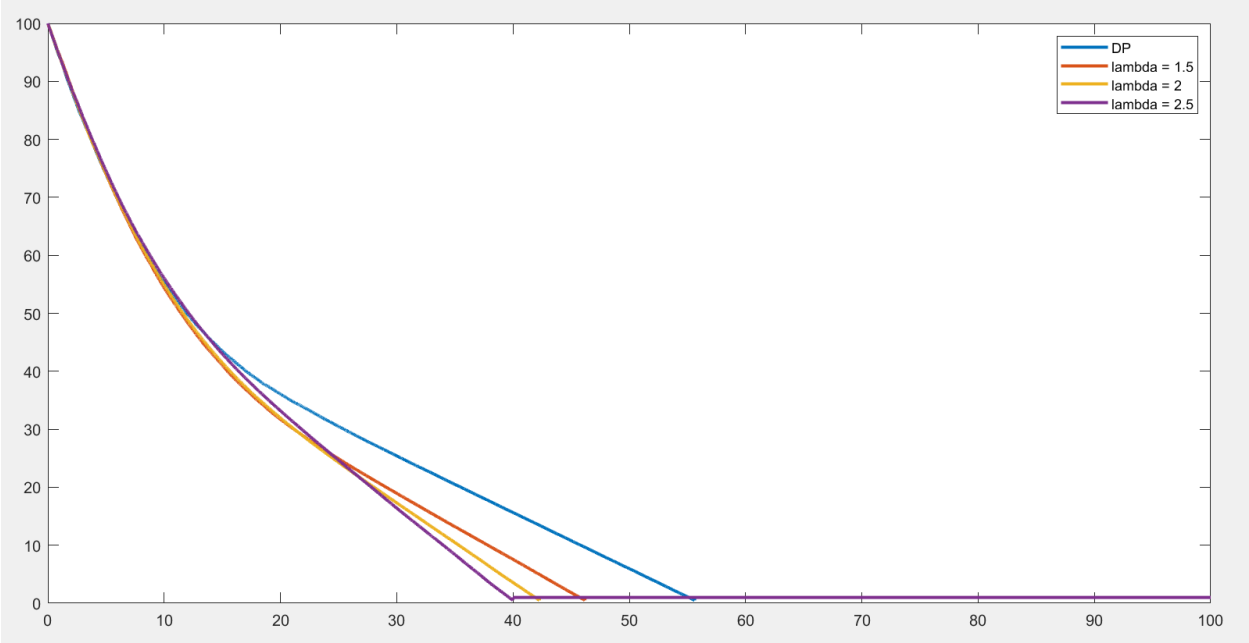
Question 4:

As the lambda increases the system tries to reach the target faster. But due to noise in the reading its taking more time for the Missile to reach the target compared to the ideal scenario and the time taken are close compared to previous states. And all of them missing target with some offset and are not converging for zero convergence.

- Trajectory



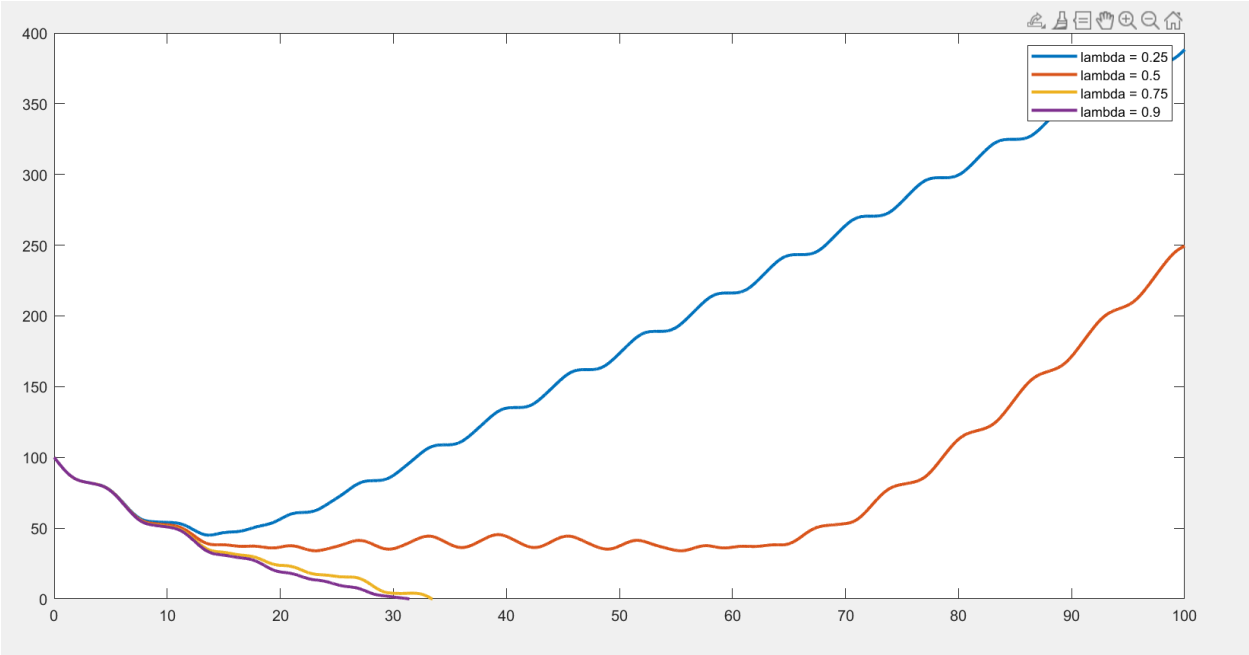
- Range plots


DP
lambda = 1.5
lambda = 2
lambda = 2.5
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
100

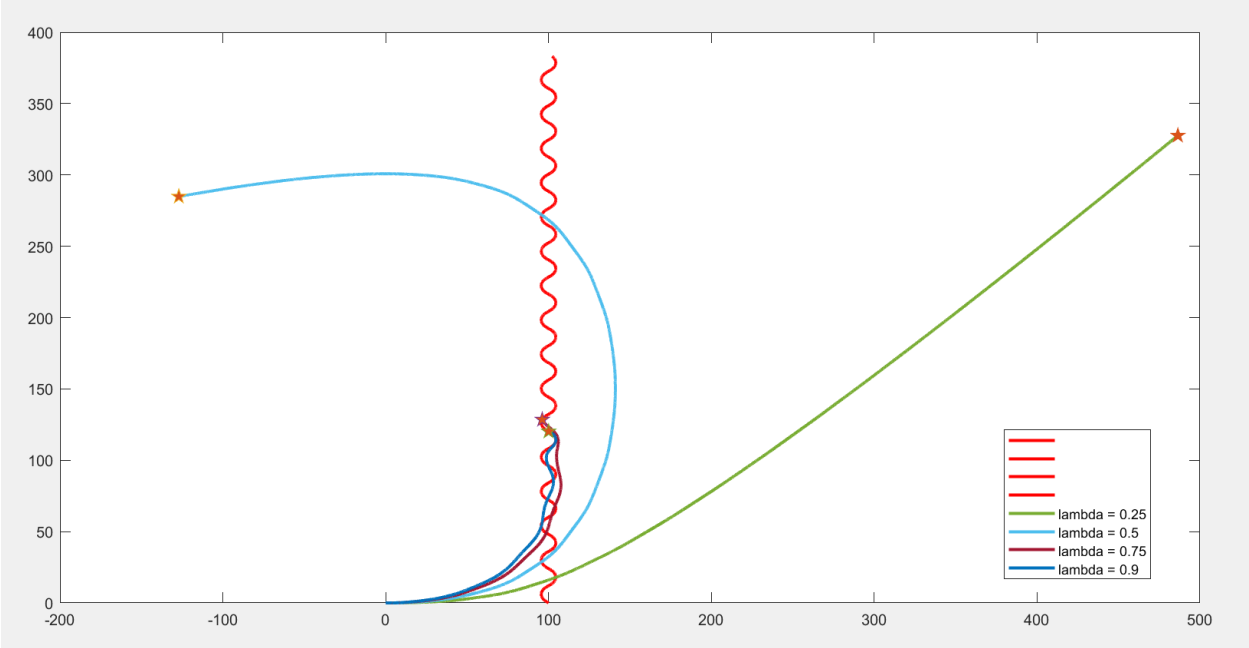
Question 5:

In this case the CBP is taking more time to hit the target than, whereas in the other case the CBP has the least time. This is happening because CBP is not designed to tackle the sudden changes that can take place in the system. So having good enough high lambda gives the advantage of chasing down fast and accounting for changes.

- Trajectory

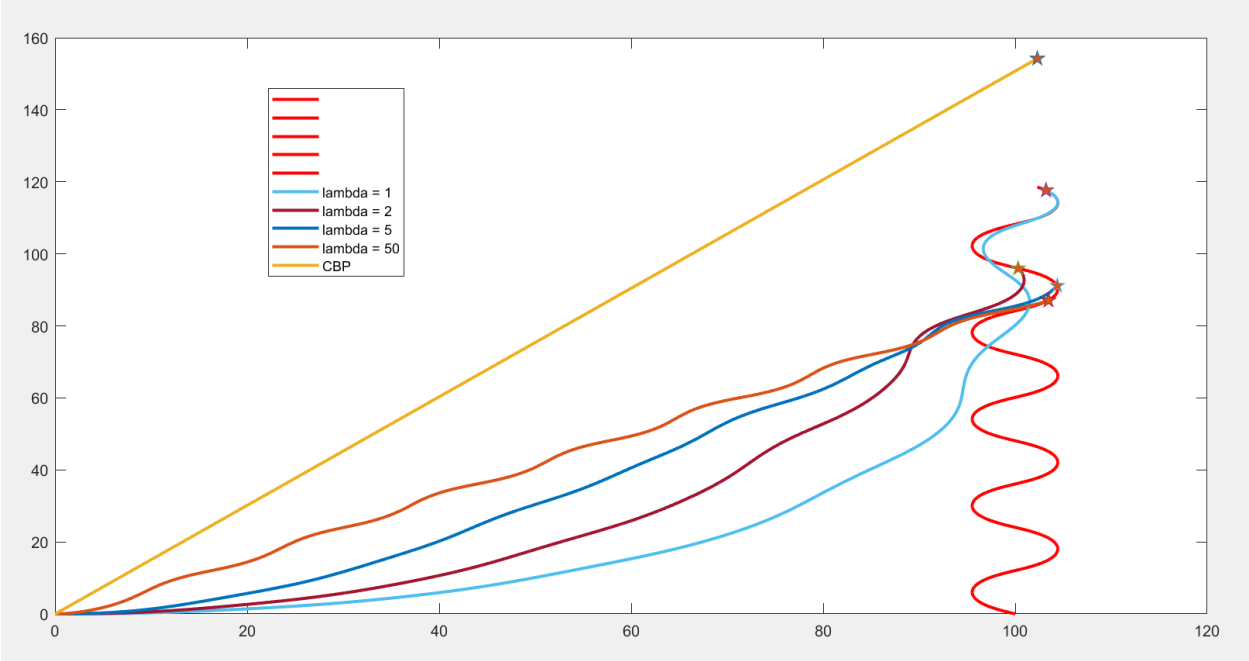


- Range plots

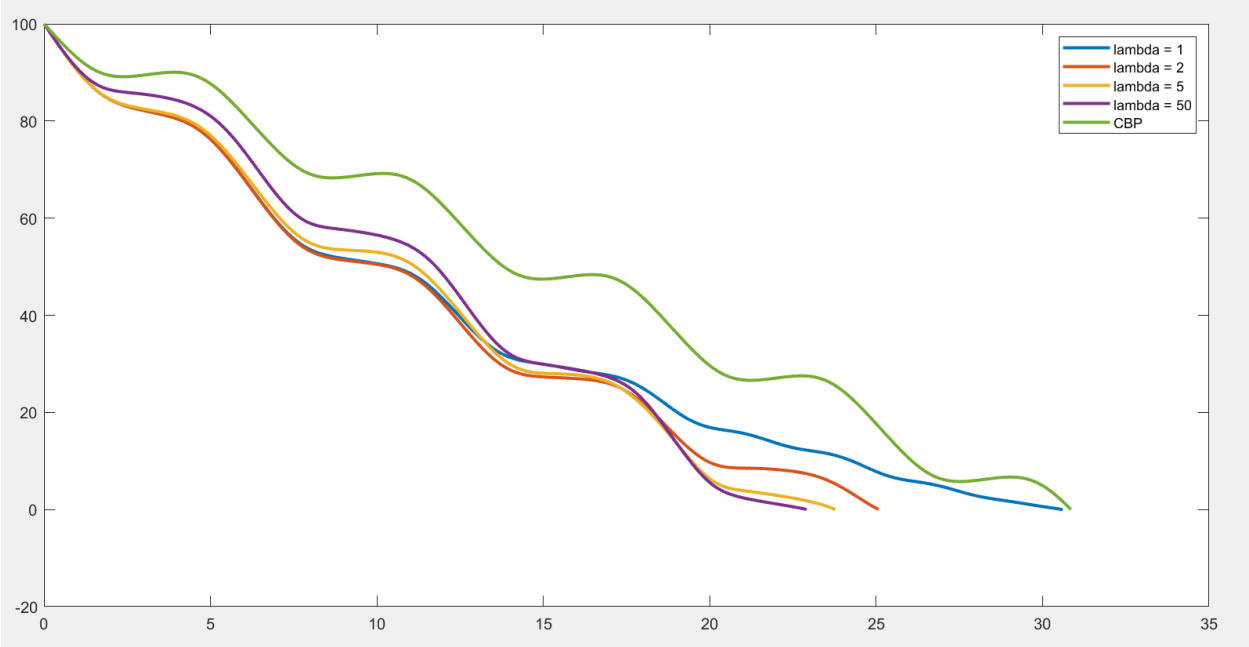


Lambda>1

- Trajectory

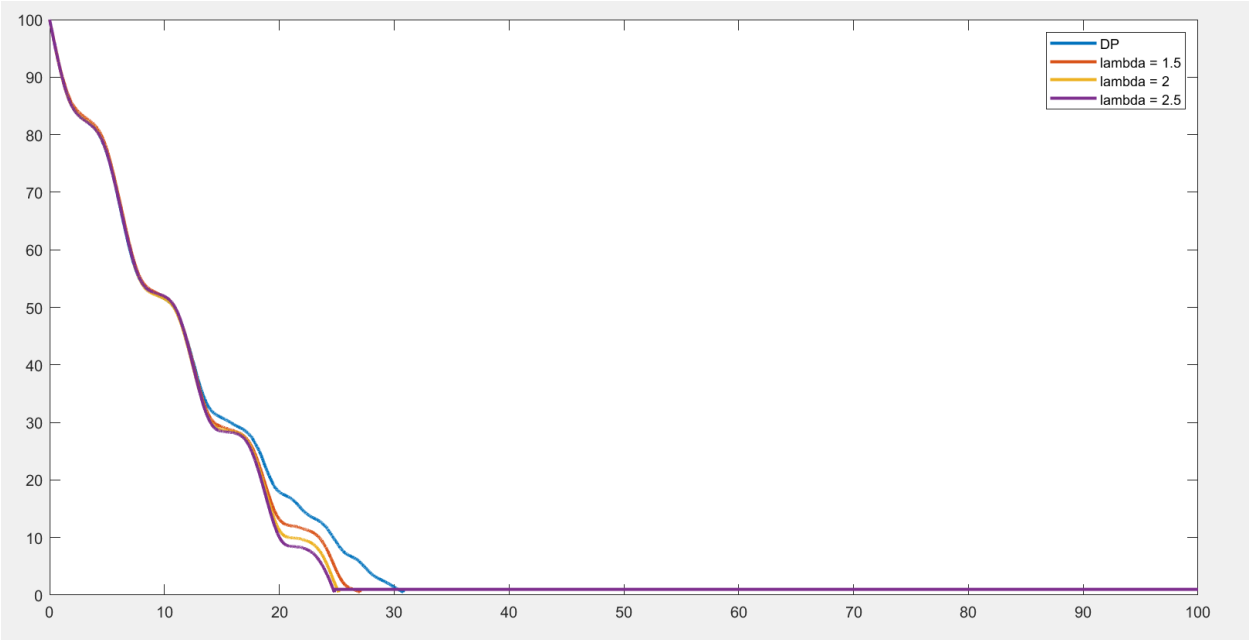


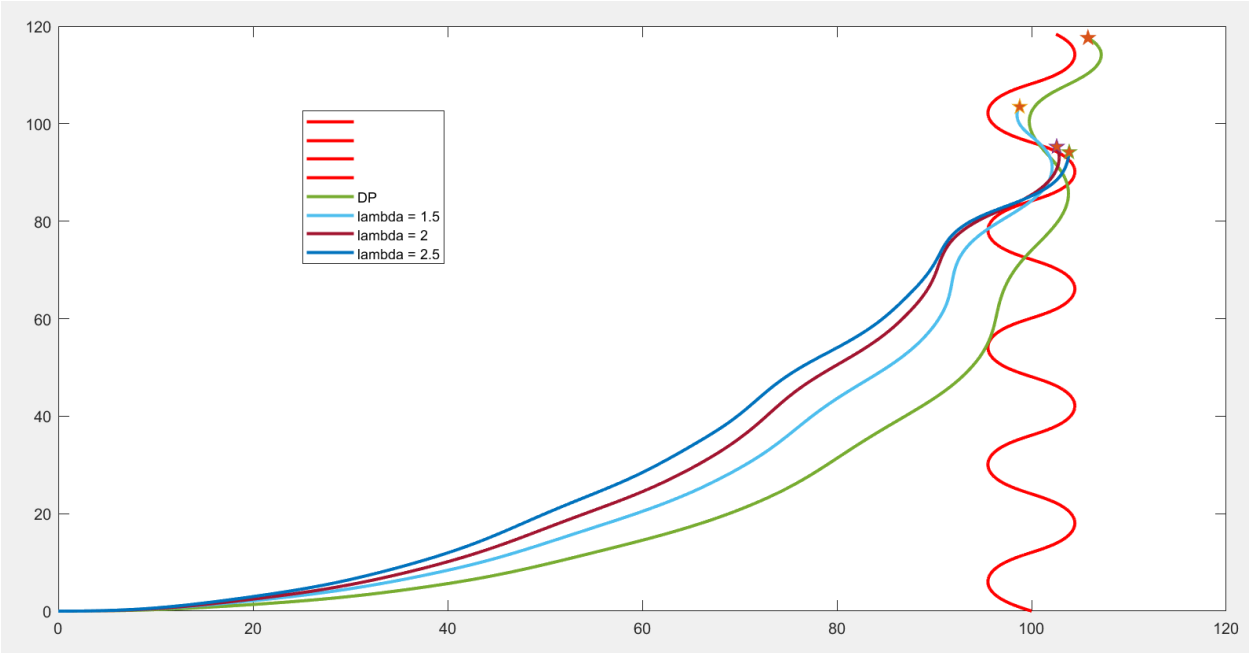
- Range plots



Question 6:

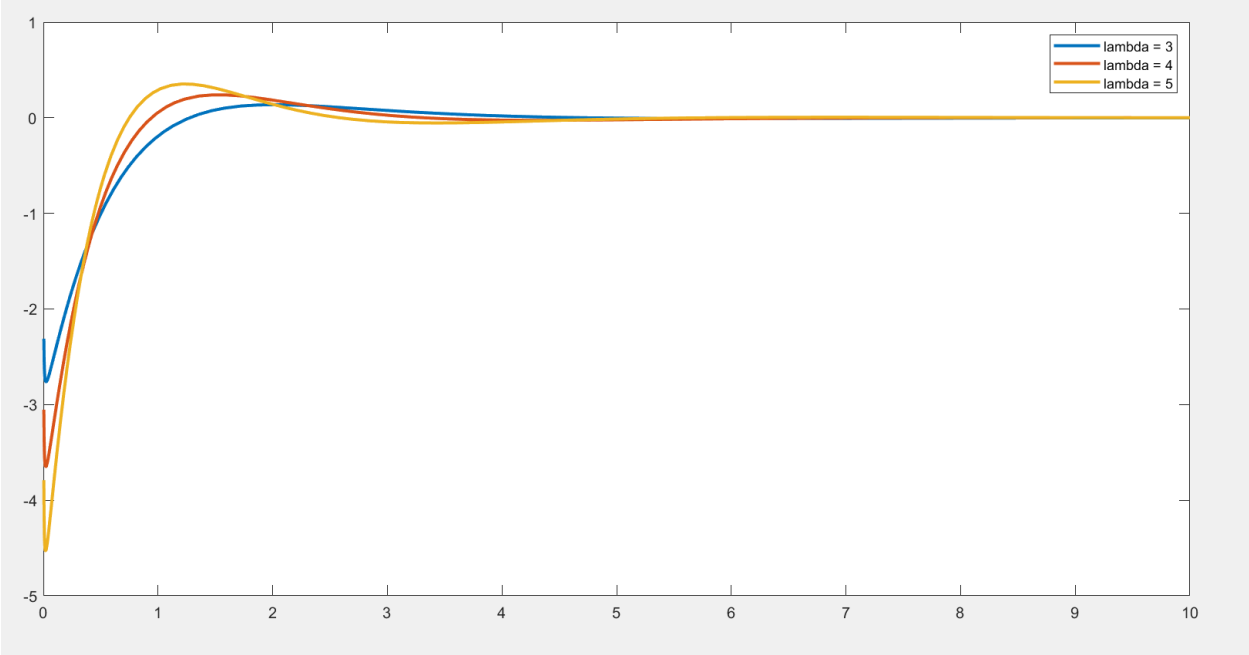
As seen above the system with high lambda is trying to converge fast and take into account of changes this is allowing the system to perform better than compared to low lambdas and CBP.





Question 7:

Part a:



Part b:

In the case of straight trajectory, if the system has not given enough time it should be tuned well with lambda to hit the target. If given enough time then all three can reach the target when given enough time. In the oscillation case, the missiles missed because of sudden changes in the motion of the target and when given enough time the missiles hit the target well.