MATLAB Homework Report

Kutay Tire

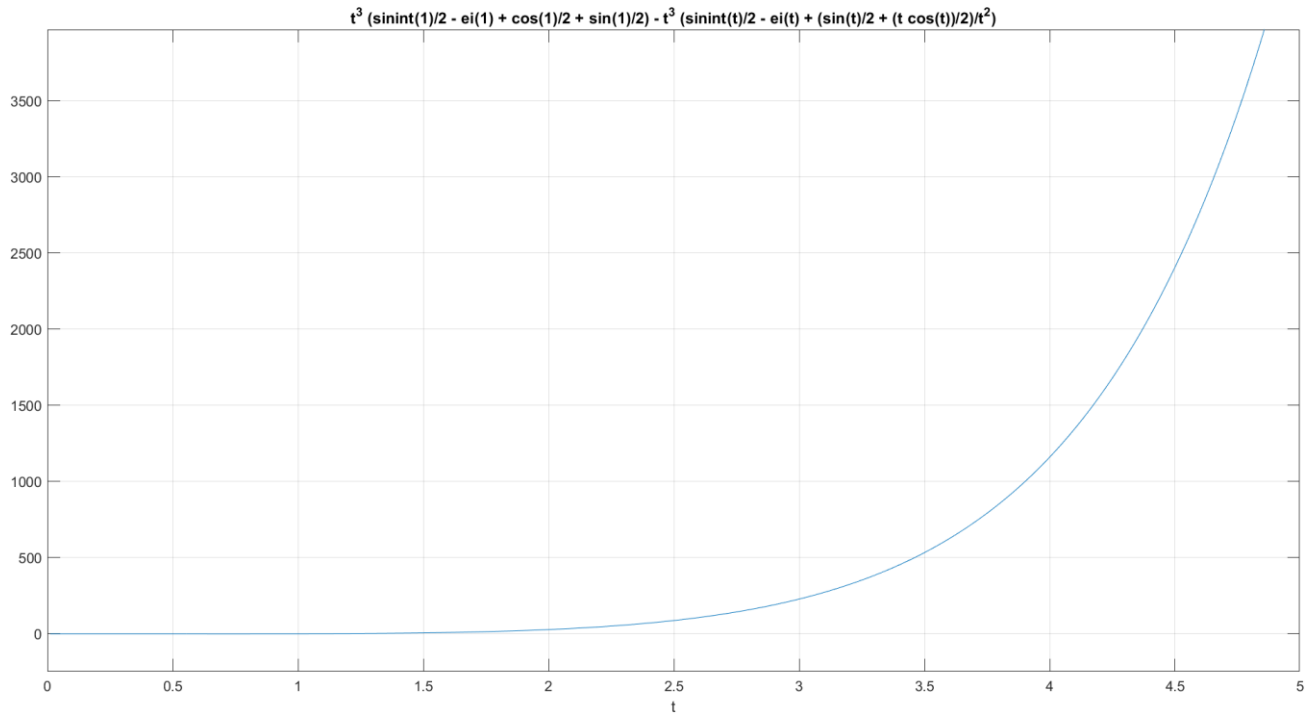
Department of Computer Science

22001787

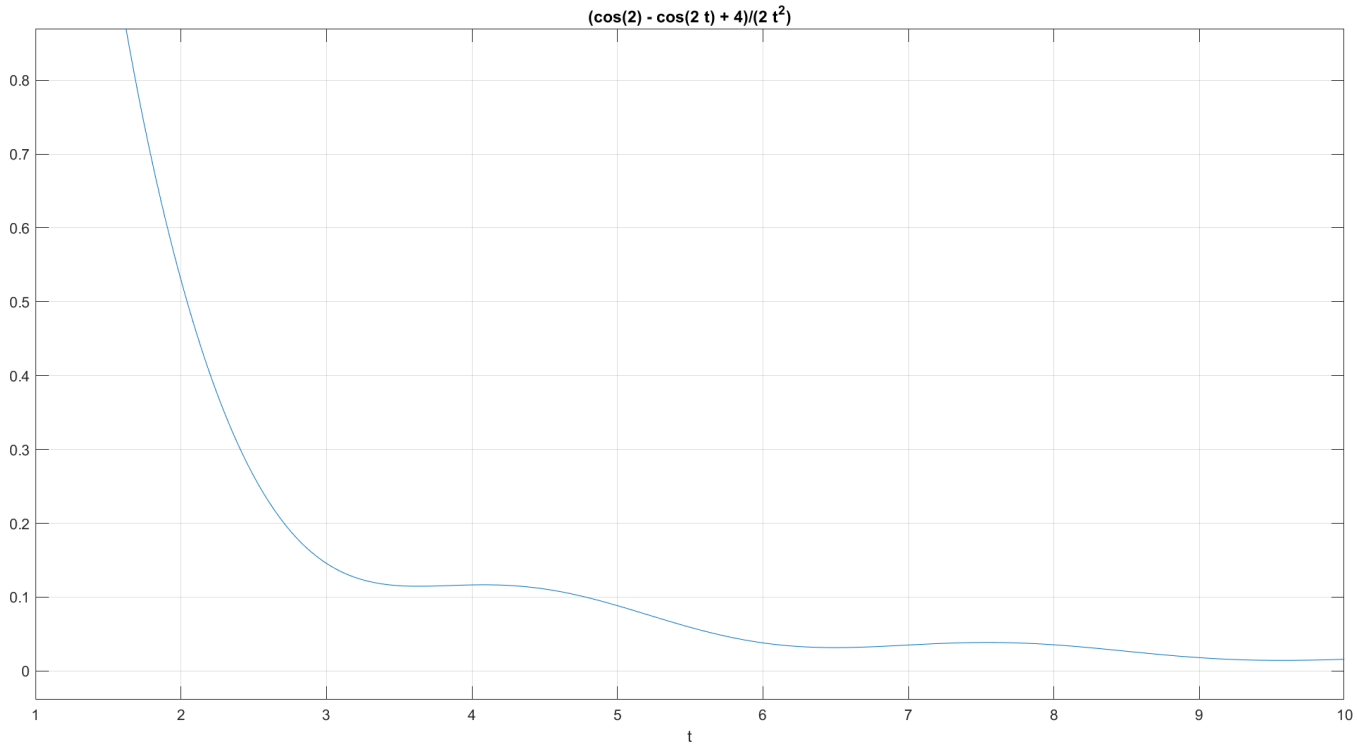
17.07.2022

Question 1.

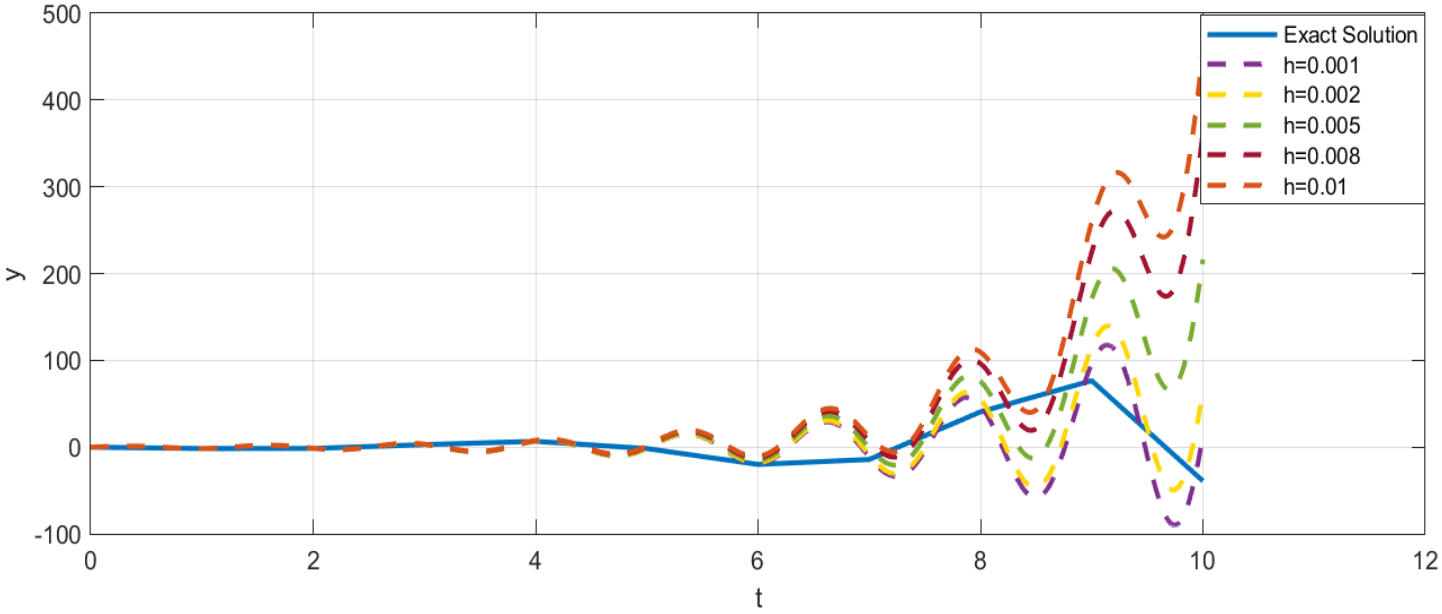
a.)



b.)

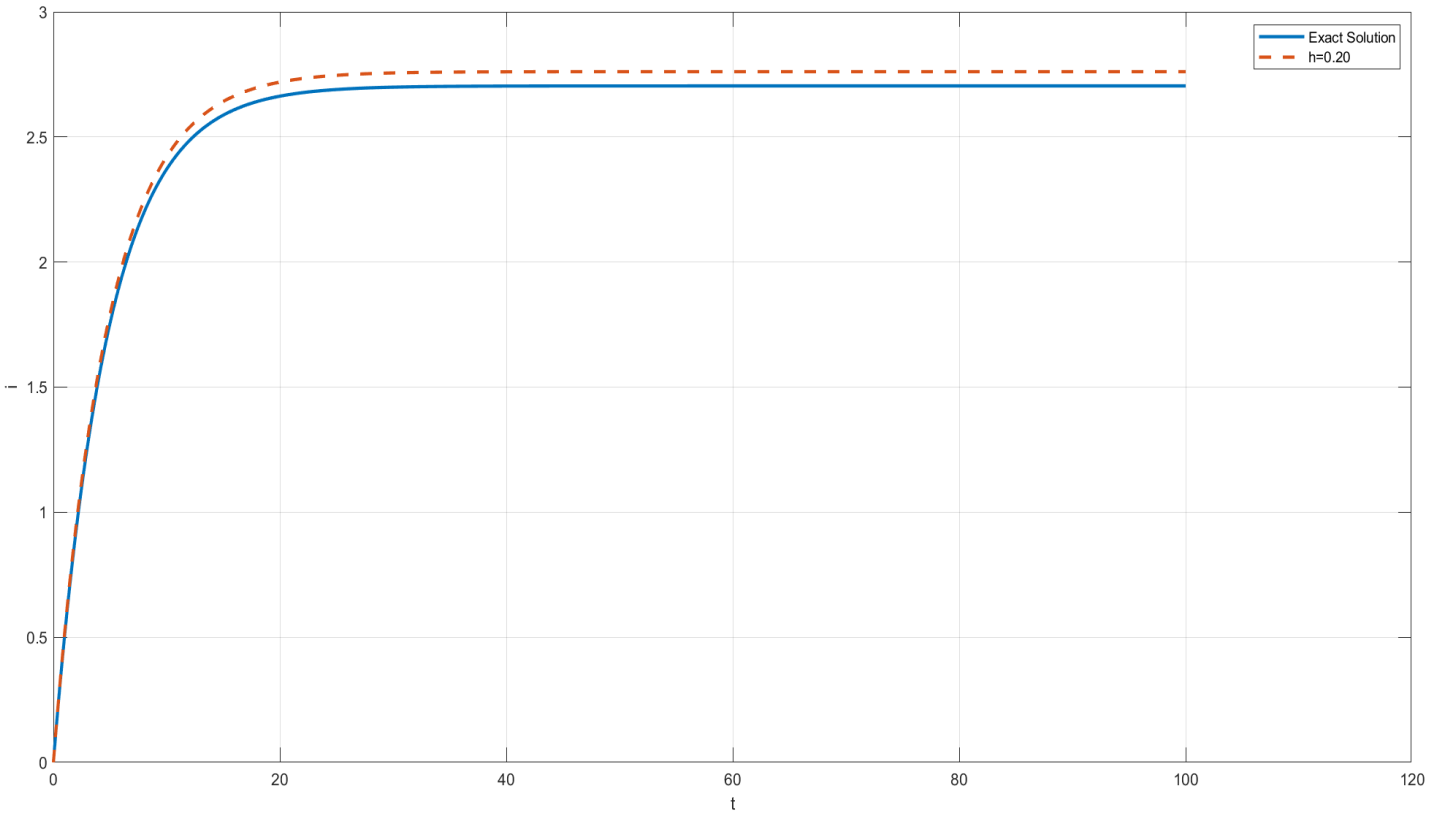


Question 2.



As it can be seen, with smaller values of h better results are obtained. The best result is obtained when h is 0.001 because there are more iterations and fewer errors with smaller steps. Still, Euler's method cannot completely reflect the exact solution as can be seen from the graph. However, the method yields better results as h goes to 0.

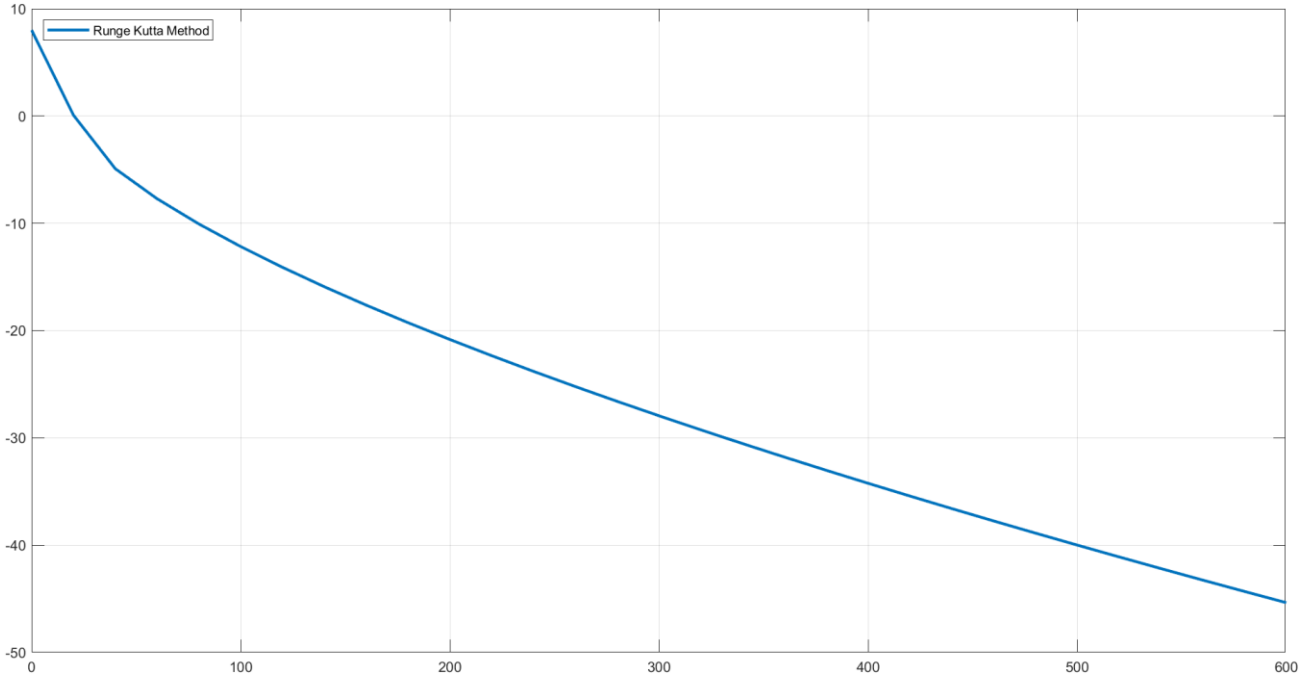
Question 3.



It is clear from the equation of V(t) is that as t increases, the value of V(t) decreases. Therefore, for larger values of t, di/dt appears almost zero. It can also be seen from the graph because the value of the current does not change after a certain value of t.

Question 4.

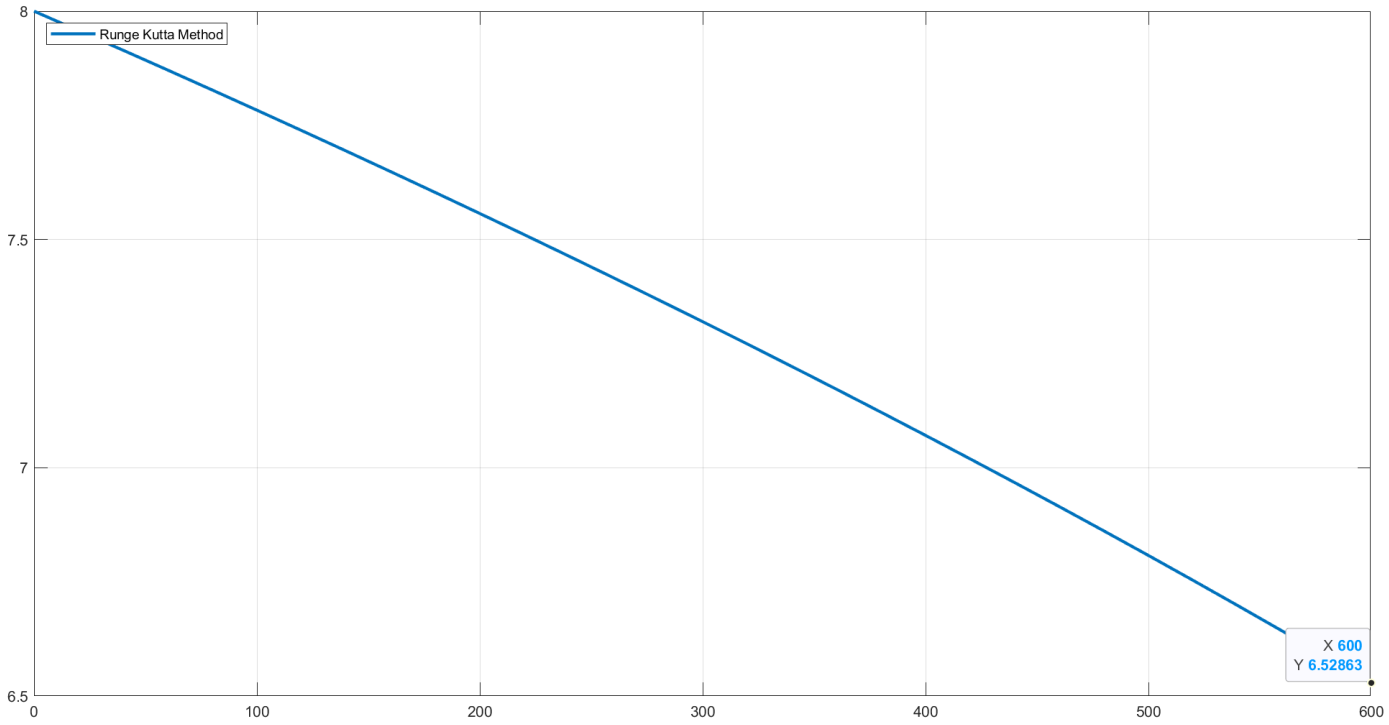
a.)



Here is the graph of the rate of flow for the case of the given values. However, since the function decreases at a rate greater than expected, the cone empties within a minute and therefore it is completely empty after 10 minutes and even gets negative values which shouldn't happen. This happens due to the large values of g and r(radius). However, with some small changes to these values and the function itself, I managed to obtain better results. For my version, g is 32, r is 0.1 and the function is:

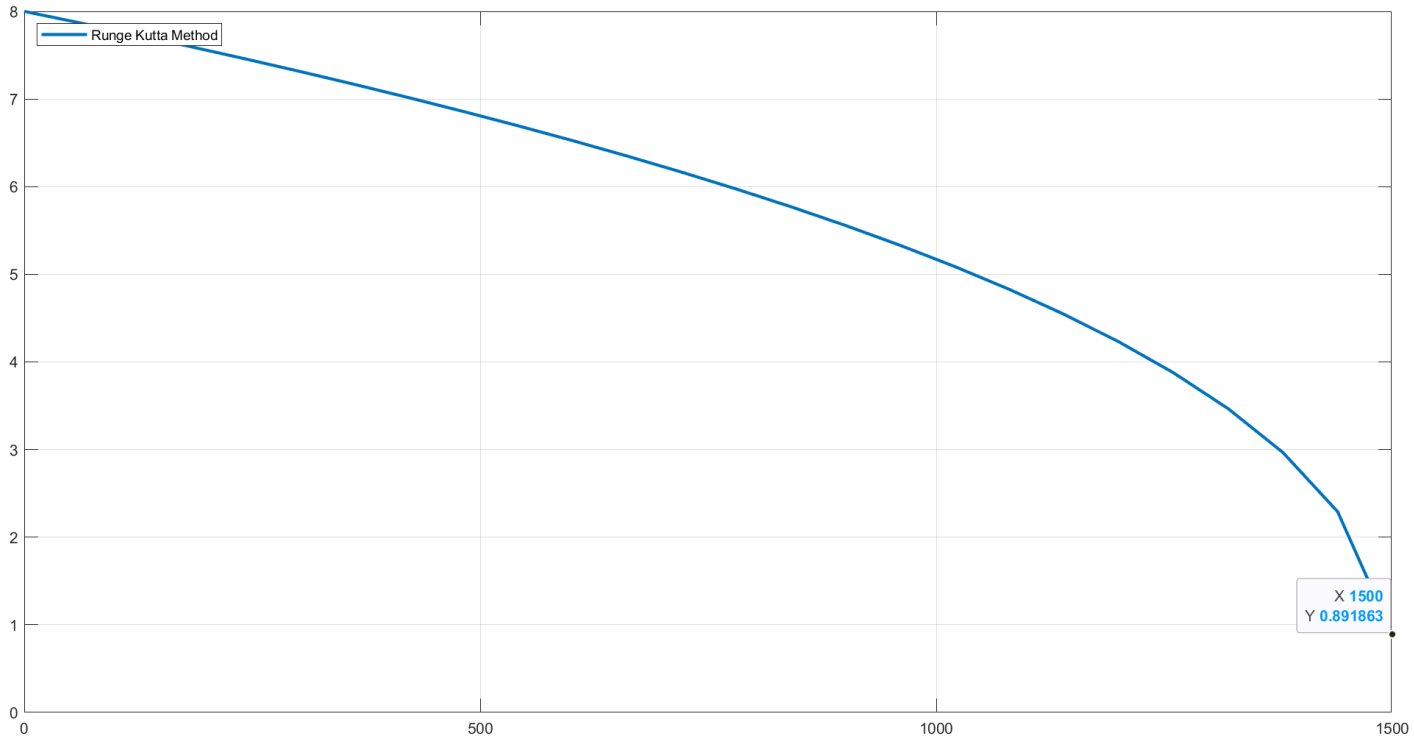
$\frac{dy}{dt}$ = -0.6$\frac{\pi r^2\sqrt{2g}\sqrt{y}}{A(y)}$ which has a lower flow rate.

For these values, the graph is below:



So, the water level is 6.5286 ft after 10 minutes.

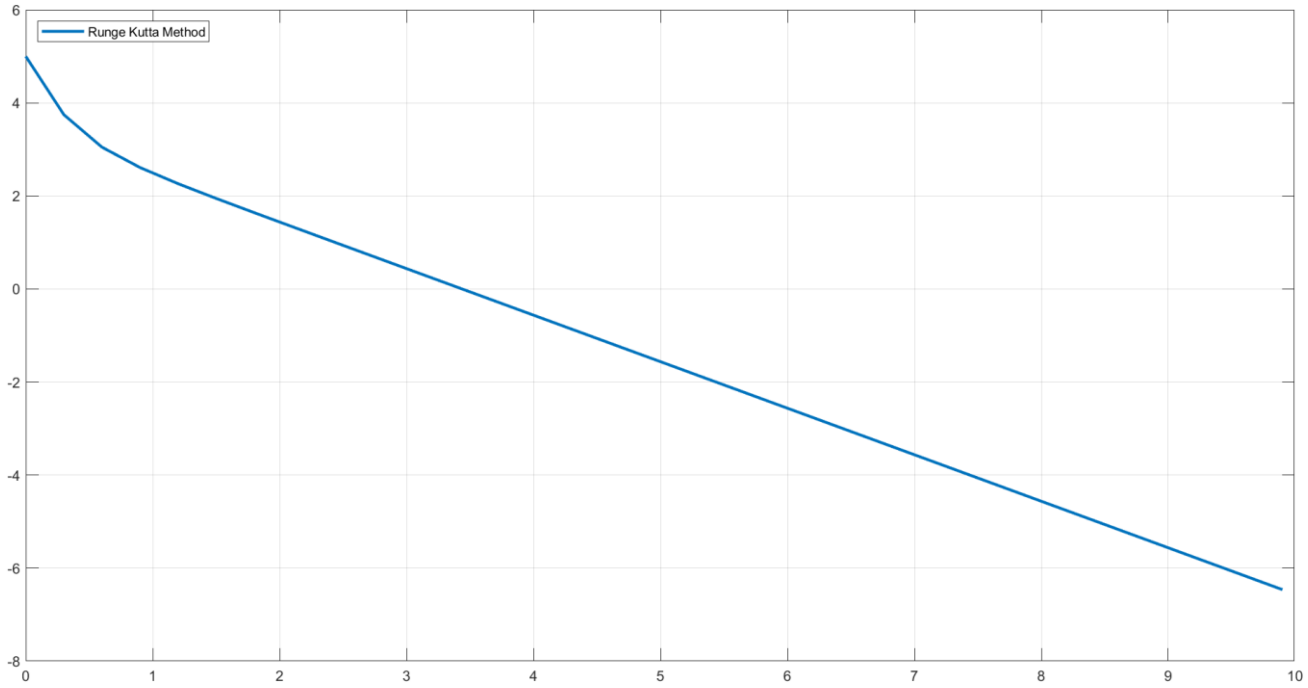
b.) Again for the given values, the cone empties within a minute. However, for the values I chose, the graph is below with h = 60s.



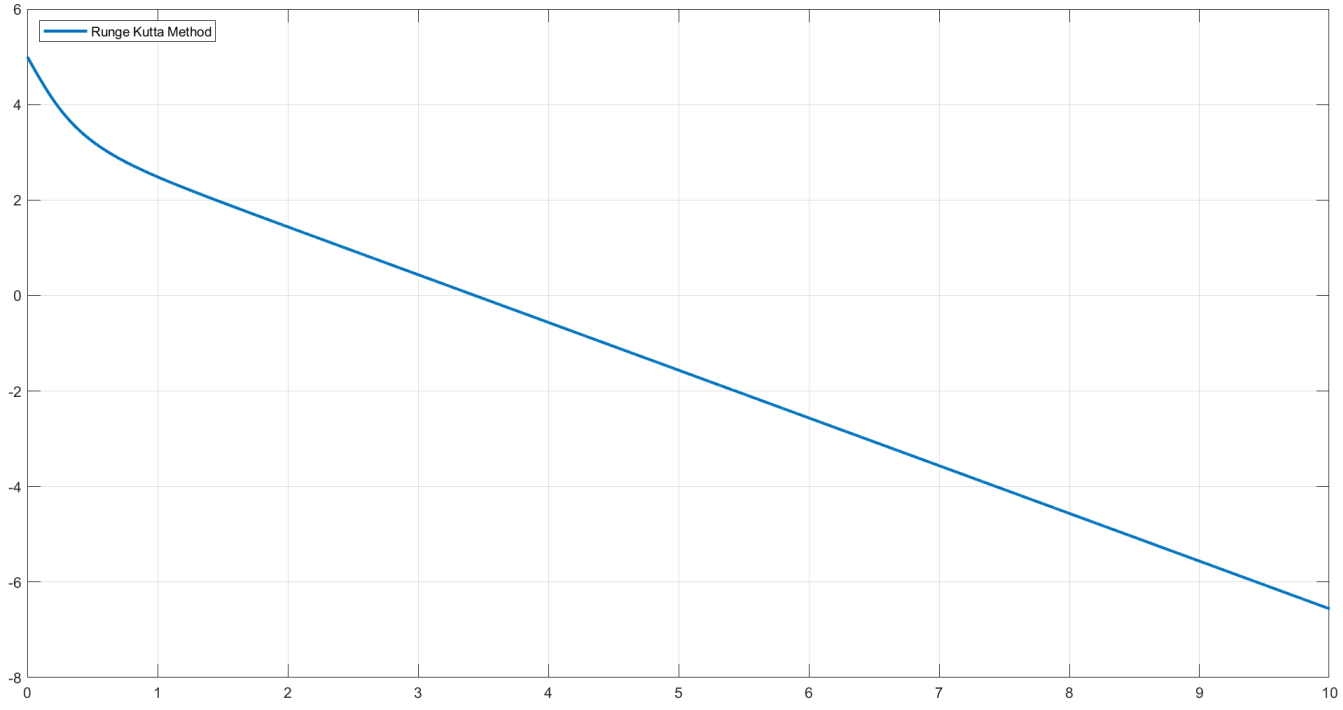
If t is larger than 1500, an error occurs due to the negative values inside the root. So, the whole cone empties about in 25 minutes as 1500/60 = 25.

Question 5.

a.)



b.)



It can be seen that the graph has become smoother, especially in the interval of 0-2 for x values. To achieve this, h values are made smaller and the number of steps is increased. In part a, the h value is 0.3 whereas it is 0.001 in part b. This smoothness happens because, with smaller h, the step size is also smaller. So, instead of sharp declines, there are smoother declines in part b.