Problem 1:
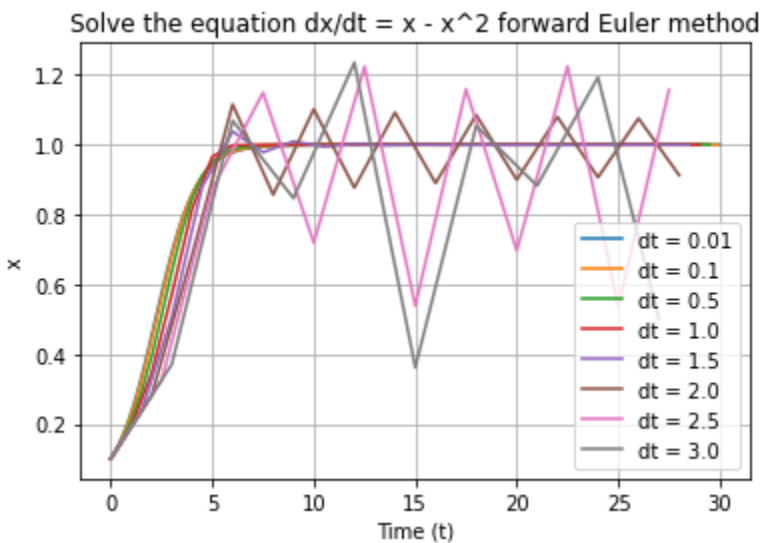
Solve the equation dx/dt = x - x^2 forward Euler method

-   From dt = 2 to dt = 3, I can see the plots for these values have spiked up and down, showing instability. This is because when x is very small (close to zero), the equation x - x^2 is approximately equal to x since x^2 will be very small, making the plot an exponential growth function. As x approaches 1, x^2 becomes larger, making the equation equal to 1, hence the flat lines on the top. However, when dt is too large (2 and above), the equation becomes unstable and oscillates uncontrollably.

Problem 2:
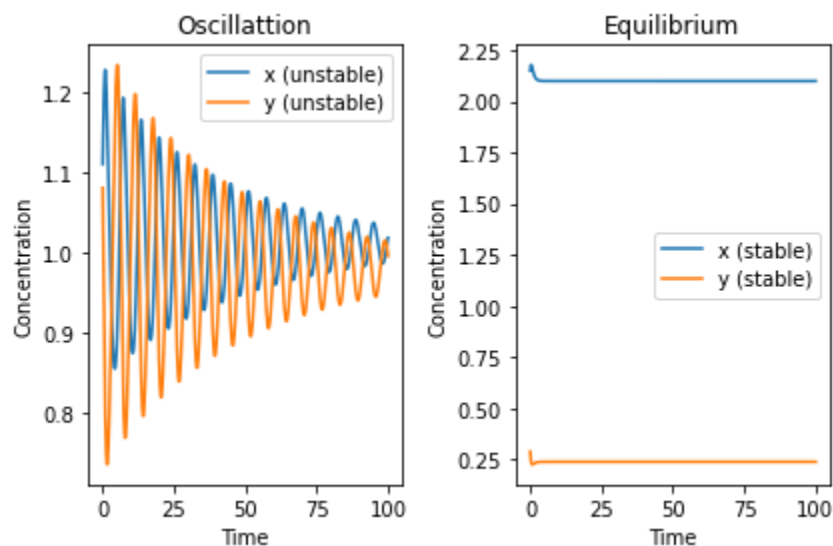
-   For oscillation case: a = 0.01 and b = 1
-   For equilibrium case: a = 1.05 and b = 1.05
    I notice b has to be around 1 and not higher otherwise it will reach equilibrium.

Problem 3:

RK4 Method
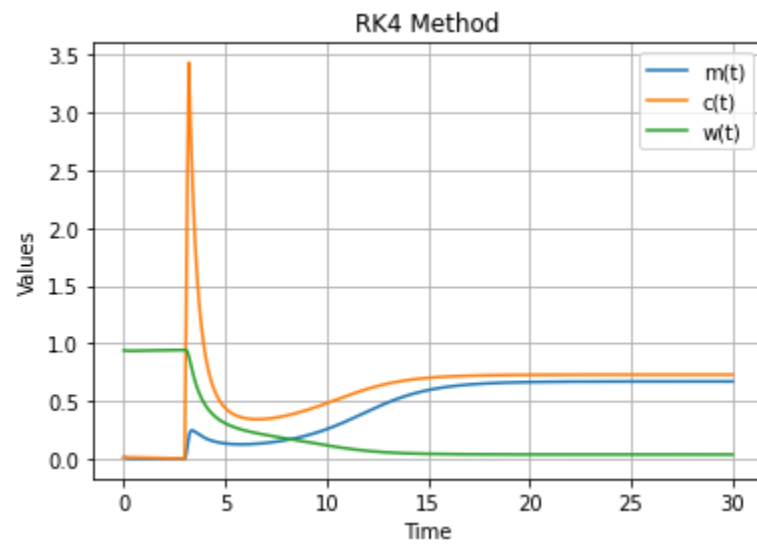
- For alpha in a range from 10 - 20, the functions don't go back to the equilibrium after the alpha change.