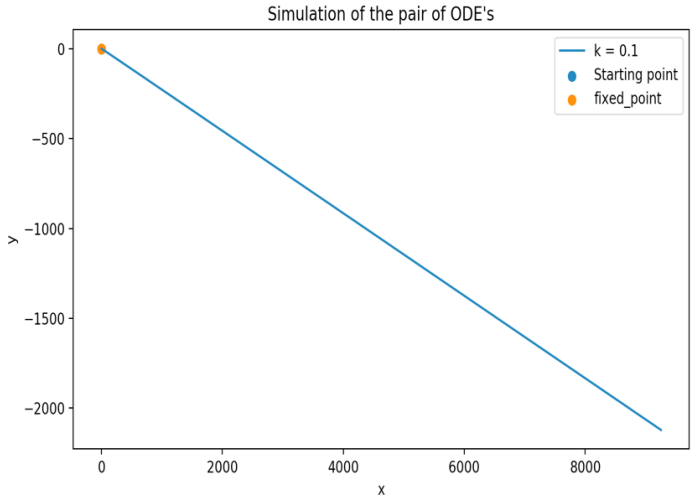
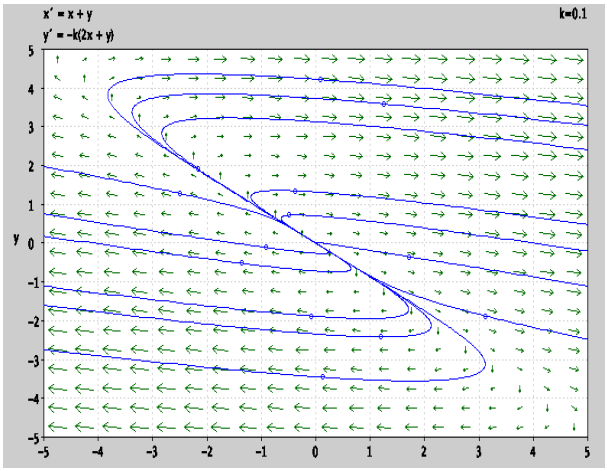
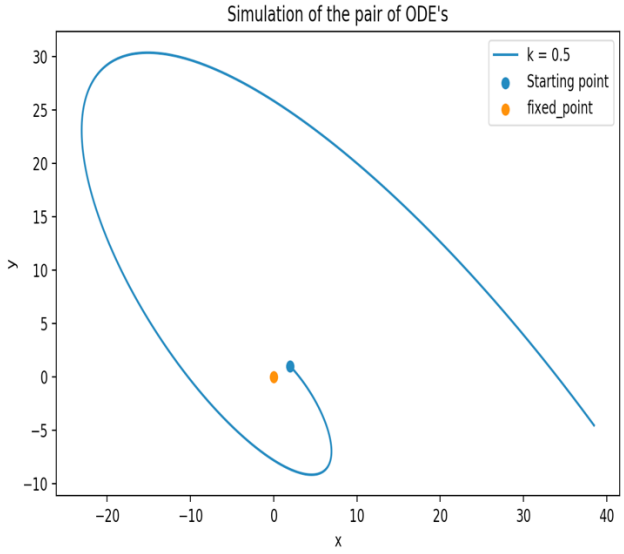
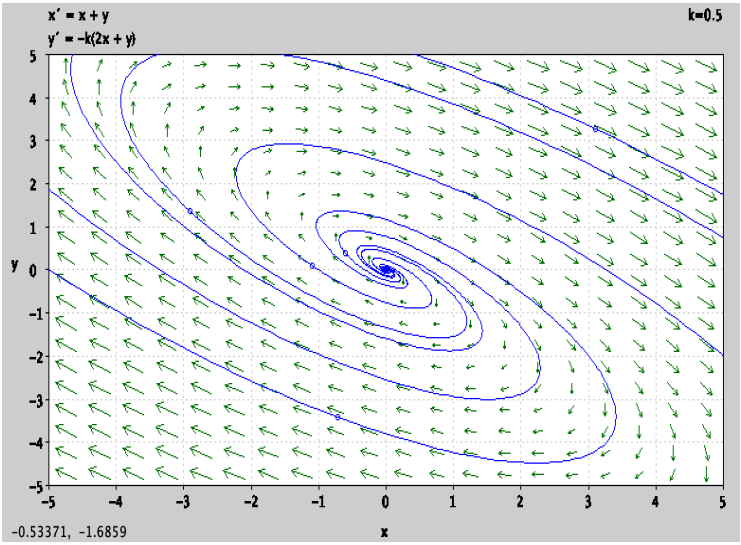
I have included plots from both my code(which implements Euler Integration, with (2, 1) as the initial point. Because of Euler integration, the results are slightly inaccurate) and pplane, a software which automatically plots the phase planes of system of ODE's. The plots in the left are generated from my code while the ones in the right are generated by pplane.



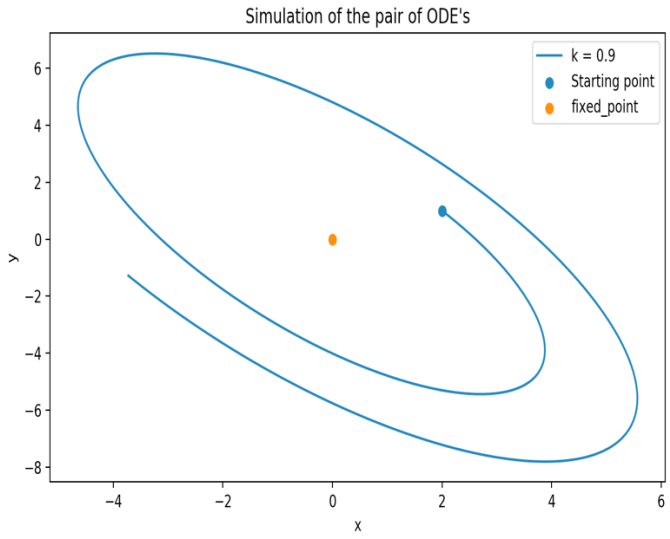


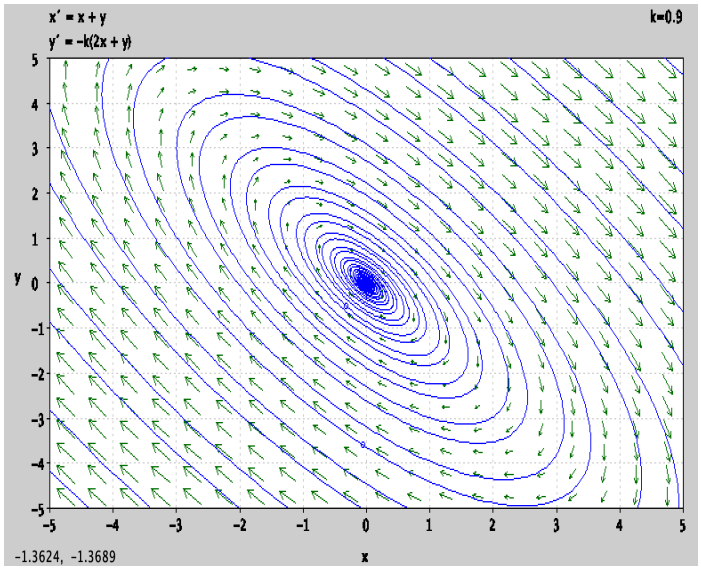
k = 0.1 < 0.1715 < 1. the solution curve moves away from the fixed point exponentially.



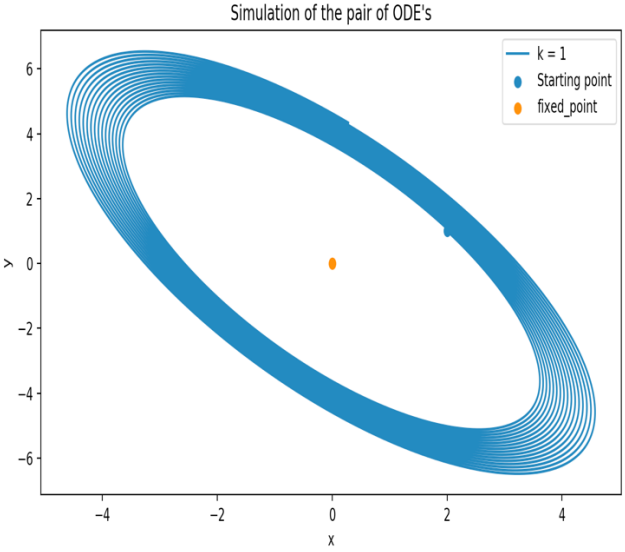


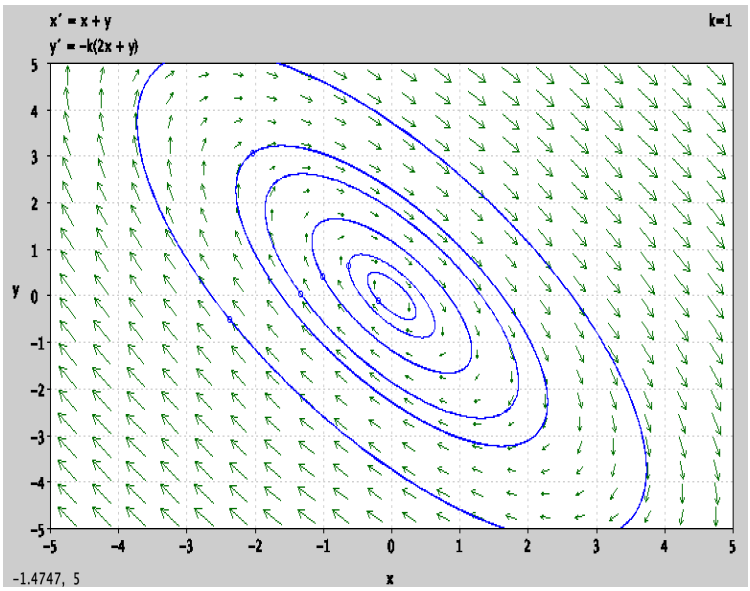
k = 0.5, 0.1715 < 0.5 < 1, the curves spirals away (oscilltaory behavior) from the fixed point.



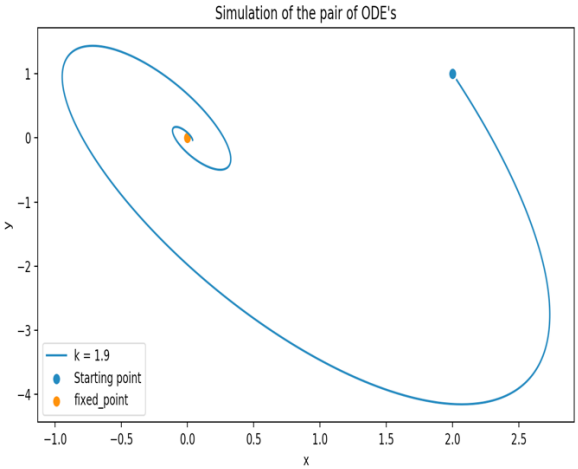


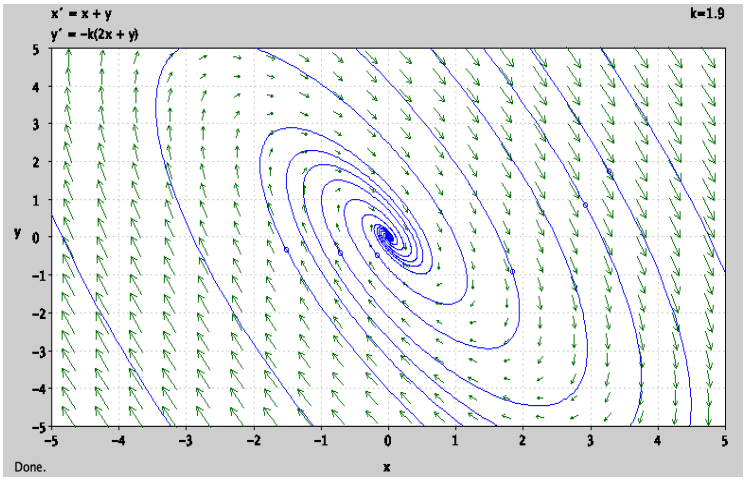
k = 0.9, 0.1715 < 0.5 < 1, the curves spirals away (oscilltaory behavior) from the fixed point.





k = 1, the curve moves around the fixed point. (There should be only one circle in the left plot. The multiple circles are due to use of Euler)





k = 1.9 > 1, the curve spirals towards the fixed point.