EC60007 Computational Neuroscience- Project I
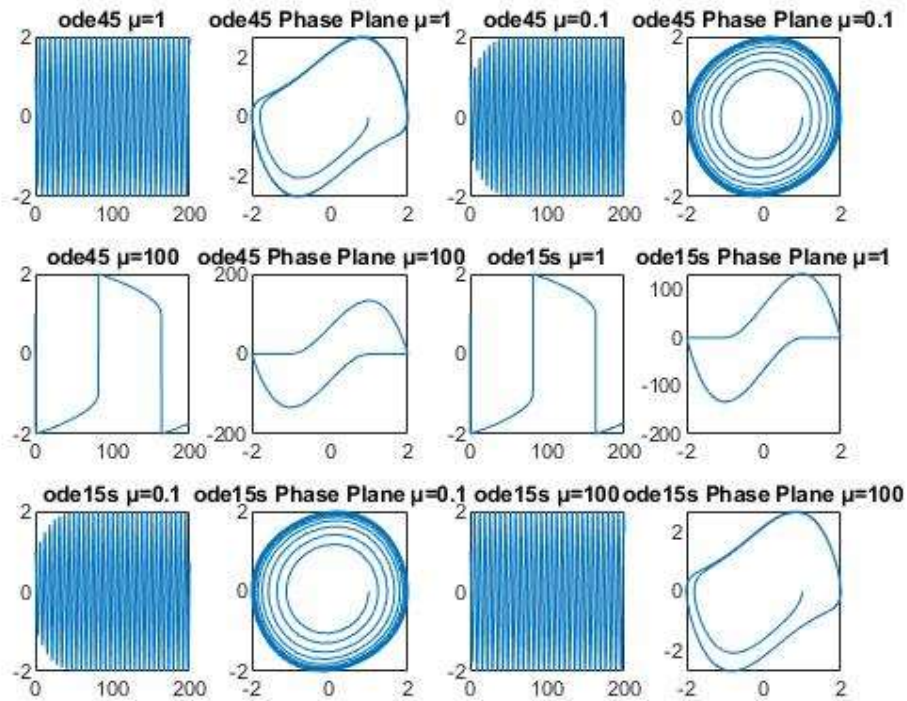
Van-der-Pol (VDP) equation reduction

$$\frac{d^2 y}{dt^2} - \mu(1 - y^2)\frac{dy}{dt} + y = 0 \ \forall \ \mu > 0;$$

$$y = Y_1; \ \ \frac{dy}{dt} = \frac{dY_1}{dt} = Y_2; \ \ \frac{dY_2}{dt} = \frac{d^2 y}{dt^2}$$

$$\frac{dY_2}{dt} - \mu\left(1 - Y_1^{\ 2}\right).Y_2 + Y_1 = 0 \quad \boxed{\frac{dY_2}{dt} = \mu\left(1 - Y_1^{\ 2}\right).Y_2 - Y_1}$$

Output Plot:

Comments/Observations:

1. Ode15s was found to comparatively faster (0.975s) than Ode45 solver (2.287s) for the given set of equations. Accuracy of Ode45 was better than that of Ode15s which approximated a number of steps to achieve the faster speed.

2. When the value of μ is increased, the shape of the curve indicates that the steady state is achieved faster.