```
In [1]: import numpy as np
        import matplotlib.pyplot as plt
        from scipy.integrate import solve_ivp
        import matplotlib.cm as cm
```

```
In [14]: def stable_manifold(y):
             return -(1/6)*y**2 -(1/24)*y**3 -(1/240)*y**4

         def xdot(state, t):
             x, y = state
             return [ 2*x + y**2,
                     -2*y + x**2 + y**2]
```

```
In [56]: timespan = (0., -13.)
         y0 = 0.005
         initial_conditions = [stable_manifold(y0), y0]

         sol = solve_ivp(lambda t, y: xdot(y, t), t_span=timespan, y0=initial_conditions, max_step = 0.1)

         x, y = sol.y
```

```
In [78]: fig, axs = plt.subplots(1, 1, figsize =(12, 12))
         #Vector field
         xvect, yvect= np.meshgrid(np.linspace(-2, 1, 20),
                                   np.linspace(-0.75, 1.5, 10))

         #Update vector field
         u = 2*xvect + yvect**2
         v = -2*yvect + xvect**2 + yvect**2

         #Plotting Stream plot
         axs.streamplot(xvect,yvect,u,v, density=1.4, linewidth=None, color='#A23BEC' )

         #Plotting x any y axes
         axs.plot(np.linspace(0, 0, 20), np.linspace(-0.75, 1.5, 20), color='k')
         axs.plot(np.linspace(-2, 1, 20), np.linspace(0, 0, 20), color='k')
         axs.grid(True)

         axs.plot(x, y, color = "#FFC107")



         #Plotting start and end points
         axs.annotate("Start", xy=(stable_manifold(y0), y0), xytext=(stable_manifold(y0) + 0.025, y0 + 0.(
         axs.scatter(stable_manifold(y0), y0, color = "k")

         axs.annotate("End", xy=(x[-1], y[-1]), xytext=(x[-1] + 0.02, y[-1] - 0.05))
         axs.scatter(x[-1], y[-1], color = "k")




         axs.set_title("Approximation of Global Stable Manifold.")
         axs.set_facecolor("#e1e2e3")
```