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In [56]: import numpy as np
import matplotlib.pyplot as plt
from scipy.integrate import solve_ivp
import matplotlib.cm as cm
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In [45]: def stable_manifold(y):
    return -(1/6)*y**2 - (1/24)*y**3 - (1/240)*y**4

def unstable_manifold(x):
    return (1/6)*x**2 + (1/360)*x**4 + (1/1296)*x**5 + (1/3024)*x**6
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In [55]: 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.set_facecolor("#e1e2e3")
#Getting stable manifold
ypts = np.linspace(-0.75,1.5,50)
stable = list(map(stable_manifold, ypts))

#Getting unstable manifold
xpts = np.linspace(-2,1,50)
unstable = list(map(unstable_manifold, xpts))

#Plotting manifolds
axs.plot(stable, ypts, label = "Stable", color="#ff4534")
axs.plot(xpts, unstable, label = "Unstable", color="#2ff754")

axs.set_xlabel("x")
axs.set_ylabel("y")
plt.title("Phase Portrait with Stable/Unstable Manifolds")
axs.legend()

# Show plot with grid

plt.show()
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