Unit 4 Lesson 3

- We have come full circle back to linear algebra for a system

$$\dot{x} = ax + by$$

$$\dot{y} = cx + dy$$

we can rewrite

$$\mathbf{X}(t) = \begin{pmatrix} x(t) \\ y(t) \end{pmatrix}$$

and use $\mathbf{X}(t)$ to generate a phase portrait.

- Consider the system

$$\dot{x} = my$$

$$\dot{y} = mx$$

with $\mathbf{X}(t) = c_1 e^{t}\begin{pmatrix} 1 \\ 1 \end{pmatrix} + c_2 e^{-t}\begin{pmatrix} 1 \\ -1 \end{pmatrix}$

We can get a huge number of solutions by setting c_1 and c_2 to whatever we desire

Example Problem

Given that $\lambda_2 < 0 < \lambda_1$, we can approximate the curve