Systems of ODEs

Now, we're going to tie everything back to differential equations, and eventually work in all of the linear algebra stuff that we just covered.

Definition 0.1. A *first order system of differential equations* is a

Solutions to Systems

What does the solution to a system of ODEs look like?

Example. Show that

$$\vec{x}(t) = \begin{bmatrix} 2e^{-2t} + 4e^{3t} \\ e^{3t} - 2e^{-2t} \end{bmatrix}$$

solves the system

$$\frac{dx_1}{dt} = 2x_1 + 4x_2 \qquad \frac{dx_2}{dt} = x_1 - x_2 \qquad \vec{x}(0) = \begin{bmatrix} 6 \\ -1 \end{bmatrix}.$$