# Systems of Differential Equations: A First Look

#### Department of Mathematics

Salt Lake Community College

(Slides by Adam Wilson)

Often a population study will involve two or more interacting species. This leans two two for more **coupled** differential equations. (Similar systems arise in electrical and mechanical engineering.)

Often a population study will involve two or more interacting species. This leans two two for more **coupled** differential equations. (Similar systems arise in electrical and mechanical engineering.)

For example:

$$x' = 2x - xy$$
  
$$y' = -3y + 0.5y$$

where we are looking for two functions x and y that both depend on t.

Often a population study will involve two or more interacting species. This leans two two for more **coupled** differential equations. (Similar systems arise in electrical and mechanical engineering.)

For example:

$$x' = 2x - xy$$
  
$$y' = -3y + 0.5y$$

where we are looking for two functions x and y that both depend on t.

A simpler case is where the equations in the system are uncoupled:

$$\begin{array}{rcl}
x' & = & 2x \\
y' & = & -3y
\end{array}$$

Often a population study will involve two or more interacting species. This leans two two for more **coupled** differential equations. (Similar systems arise in electrical and mechanical engineering.)

For example:

$$x' = 2x - xy$$
  
$$y' = -3y + 0.5y$$

where we are looking for two functions x and y that both depend on t.

A simpler case is where the equations in the system are **uncoupled**:

$$x' = 2x$$
  
$$v' = -3v$$

#### Analytic Definition of a Solution of a DE System

A **solution** of a system of two differential equations is a pair of functions x(t) and y(t) that simultaneously satisfies both equations.