

## Problem Set 11.2

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Rewrite the system of differential equations into matrix form.

1.  $x' = x - y, y' = 3x - 2y$
2.  $x' = y, y' = x$
3.  $x' = -x + 3y, y' = y$

Write as two differential equations.

4.  $\begin{bmatrix} x \\ y \end{bmatrix}' = \begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$
5.  $\begin{bmatrix} x \\ y \end{bmatrix}' = \begin{bmatrix} 2 & -3 \\ -2 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$
6.  $\begin{bmatrix} x \\ y \end{bmatrix}' = \begin{bmatrix} 0 & 3 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$

Determine the eigenvalues for the system of differential equations. If the eigenvalues are real and distinct, find the general solution by determining the associated eigenvectors. If the eigenvalues are complex or repeated, solve using the reduction method.

7.  $x' = 2y, y' = x + 3y$
8.  $x' = -5x + 10y, y' = -4x + 7y$
9.  $x' = x - 2y, y' = -4x - y$
10.  $x' = -10x + 4y, y' = -3x - 2y$