

# MATH 307

## CHAPTER 6

### SECTION 6.3: HOMOGENEOUS SYSTEMS WITH CONSTANT COEFFICIENTS THE NONDIAGONALIZABLE CASE

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**EXAMPLE 1.** Find the general solution to the system

$$Y' = \begin{bmatrix} 3 & 1 \\ 0 & 2 \end{bmatrix} Y.$$

## Solving One Nonhomogeneous ODE

Given an nonhomogeneous ODE

$$y' = ay + g \tag{*}$$

the general solution is given by

$$y = y_H + y_P$$

where

- $y_H$  is the general solution to the homogeneous ODE  $y' = ay$ .
- $y_P$  is a particular solution to the ODE (\*) and it has the following form:

$$y_P(x) = e^{ax} \int e^{-ax} g(x) dx.$$

**EXAMPLE 2.** Complete the previous example.

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When  $A$  in  $Y' = AY$  is not diagonalizable, we can use the Jordan Canonical Form  $B$  of  $A$ .

**EXAMPLE 3.** Find the general solution of  $Y' = AY$  for

$$A = \begin{bmatrix} 1 & -2 & -6 \\ -2 & 2 & -5 \\ 2 & 1 & 8 \end{bmatrix}.$$

