AMS 361 R01/R03

Week 15 : Review

Junqi Huang[1]

[1]Teaching Assistant
Department of Applied Mathematics & Statistics
Stony Brook University

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How to solve homework and exam problems?

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Problem

Find the solution (GS or PS) of the given

ODE.

Solution

- Identify the type of the given ODE.
- Apply the corresponding steps for this type of ODE.
- Obtain the solution (GS or PS) of the ODE.

First Order ODE

First Order ODE

$$F(x, y, y') = 0$$

- Separable
- Linear
- Substitution
  - Polynomial
  - Homogeneous
  - Bernoulli
- Riccati
- Exact
  - Exact
  - Non-exact

Mathematical Model

Mathematical Model

- Newton's Law of Cooling
- Torricelli's Law for Draining
- The Population Model
- Newton's Laws of Motion
- Windy Day Plane Landing
- Swimmer's Problem
- River Ferry-Boat Docking
- Compound Interest

Higher Order ODE

$$F(x, y, y', y'', \ldots, y^{(n)}) = 0$$

- Constant coefficients
  - Homogeneous
    - Second order
    - Higher order
  - Inhomogeneous
    - Undetermined coefficients
    - Variational principle
- Cauchy-Euler
  - Special case: Homogeneous, Second order
  - General case
- Variable coefficients
  - Homogeneous
  - Inhomogeneous
    - Order reduction
    - Variational principle

System of ODE

System of ODE

$$X' = AX + G$$

- Constant coefficients
  - Homogeneous
    - E-Analysis
    - Separation of variables
  - Inhomogeneous
    - Undetermined coefficients
    - Separation of variables
- Variable coefficients
  - Separation of variables