Math 246, Professor David Levermore
Group Work Exercises for Discussion
Wednesday, 29 August 2018

First Set of Group Work Exercises [3]

For each of the following ordinary differential equations, give its order and state whether it is linear or nonlinear. If it is nonlinear, identify a term that makes it so.

(1) $\dfrac{\mathrm{d}^3 v}{\mathrm{d}x^3} + v\,\dfrac{\mathrm{d}^2 v}{\mathrm{d}x^2} + e^x v = x^3;$

(2) $\dfrac{\mathrm{d}^5 w}{\mathrm{d}s^5} = 2s\,\dfrac{\mathrm{d}^2 w}{\mathrm{d}s^2} + \sin(s).$

(3) $\dfrac{\mathrm{d}^2 y}{\mathrm{d}t^2} = \dfrac{y + \cos(t)}{1 + t^2}.$

Second Set of Group Work Exercises [4]

(1) Solve the initial-value problem

$$t\frac{\mathrm{d}x}{\mathrm{d}t} = 3x + t^2\,, \qquad x(1) = 0\,.$$

(2) Solve the initial-value problem

$$t\frac{\mathrm{d}x}{\mathrm{d}t} = 3x + t^2\,, \qquad x(-1) = 2\,.$$

Third Set of Group Work Exercises [3]

(1) Give the interval of definition for the solution of the initial-value problem

$$\frac{\mathrm{d}u}{\mathrm{d}t} + \frac{1}{\sin(t)}\,u = \frac{1}{t^2 - 25}\,, \qquad u(-4) = 5\,.$$

(2) Give the interval of definition for the solution of the initial-value problem

$$\frac{\mathrm{d}u}{\mathrm{d}t} + \frac{1}{\sin(t)}\,u = \frac{1}{t^2 - 25}\,, \qquad u(1) = -3\,.$$

(3) Give the interval of definition for the solution of the initial-value problem

$$\frac{\mathrm{d}u}{\mathrm{d}t} + \frac{1}{\sin(t)}\,u = \frac{1}{t^2 - 25}\,, \qquad u(6) = 2\,.$$