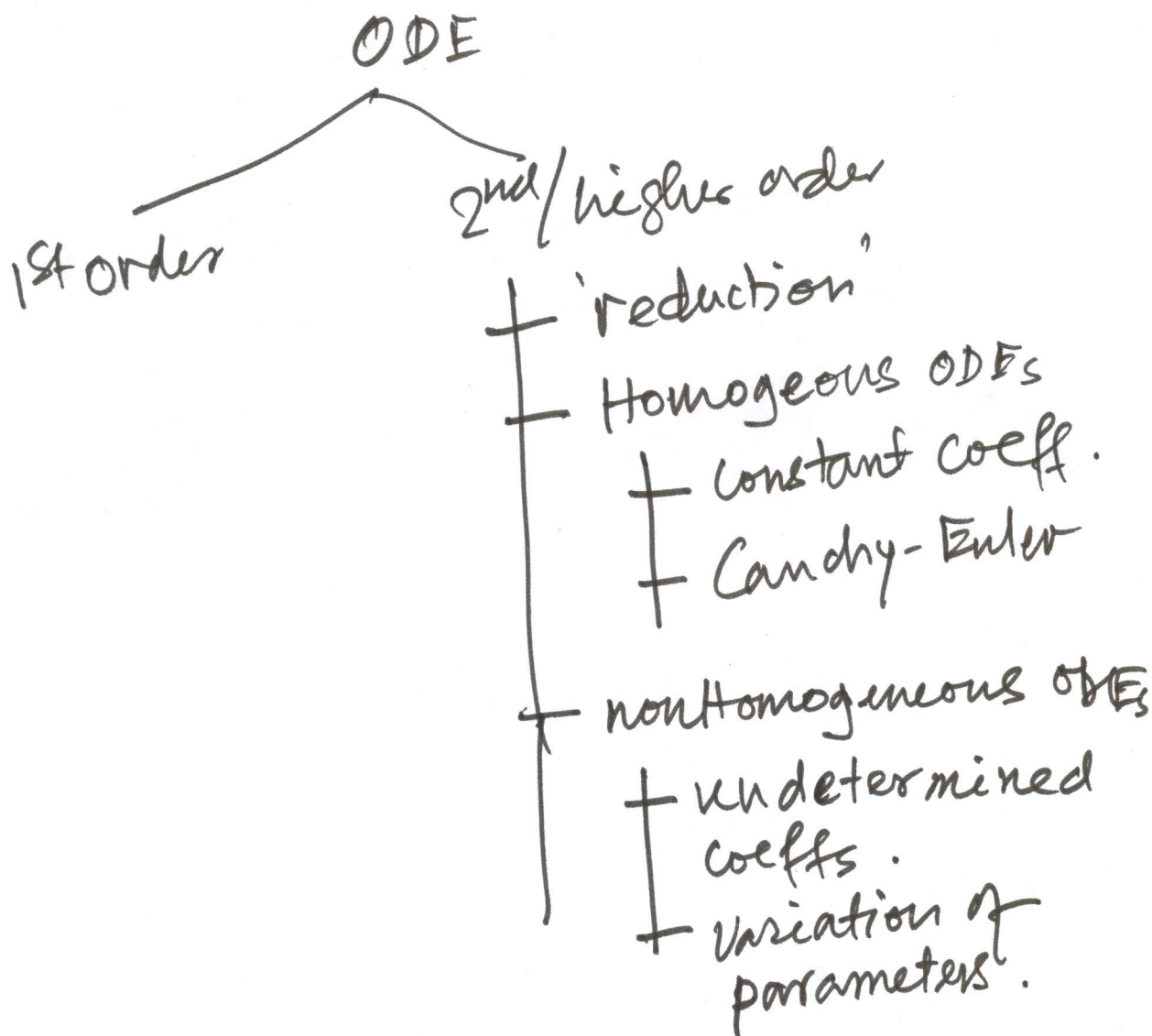


L-17

CLASS TEST

NOV-1, 2019

Solving 2nd/higher order ODEs.



Exp.

Solve

$$\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} - \frac{dy}{dx} - y = 0$$

Exp. Solve $\frac{d^3y}{dx^3} + y = 0$

Cauchy-Euler eqn.

$$ax^2 \frac{d^2y}{dx^2} + bx \frac{dy}{dx} + cy = 0, \quad x \neq 0$$

- a homogeneous ode.

- all the terms have the same dimension provided
a, b, c all constants.

Even if the coeffs. are NOT constants, it can be solved following a procedure which is used to solve constant coefficient ode.

$$ax^2 \frac{d^2y}{dx^2} + 3x \frac{dy}{dx} + cy = 0 \quad \text{--- (1)}$$

If $y(x) = x^m$ is a solution of (1)

then $\frac{dy}{dx} = m x^{m-1}$

$$\frac{d^2y}{dx^2} = m(m-1) x^{m-2}$$

Putting these in eq: (1)

$$m(m-1)ax^m + bmx^m + cx^m = 0$$

$$\Rightarrow [m(m-1)a + bm + c]x^m = 0$$

