

Exercise 8

Classify the following equations as Fredholm, or Volterra, linear or nonlinear, and homogeneous or inhomogeneous

$$u'(x) = \int_0^x (x-t)u(t) dt, \quad u(0) = 0$$

Solution

This is a Volterra integro-differential equation because one of the limits of integration is not constant. It is linear because the exponents of u and u' are 1 wherever they appear in the equation. It is homogeneous because there is no function outside the integral other than $u(x)$.