Exercise 6

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

$$u(x) = 1 + \int_0^1 u^3(t)\,dt$$

Solution

This is a Fredholm integral equation because both limits of integration are constant. It is nonlinear because of the nonlinear function of u inside the integral, $u^3(t)$. It is inhomogeneous because of 1 on the right side in front of the integral.