

Problem 28

The position of a certain undamped spring-mass system satisfies the initial value problem

$$u'' + 2u = 0, \quad u(0) = 0, \quad u'(0) = 2.$$

- (a) Find the solution of this initial value problem.
- (b) Plot u versus t and u' versus t on the same axes.
- (c) Plot u' versus u ; that is, plot $u(t)$ and $u'(t)$ parametrically with t as the parameter. This plot is known as a phase plot, and the uu' -plane is called the phase plane. Observe that a closed curve in the phase plane corresponds to a periodic solution $u(t)$. What is the direction of motion on the phase plot as t increases?