Problem 29

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

\[ u'' + \frac{1}{4} u' + 2u = 0, \quad u(0) = 0, \quad u'(0) = 2. \]

(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 \( u \) in the phase plane (see Problem 28). Identify several corresponding points on the curves in parts (b) and (c). What is the direction of motion on the phase plot as \( t \) increases?