

Problem 1

In each of Problems 1 through 4, transform the given equation into a system of first order equations.

$$u'' + 0.5u' + 2u = 0$$

Solution

Let $u = x_1$.

$$x_1'' + 0.5x_1' + 2x_1 = 0$$

Finally, let $x_2 = x_1'$.

$$x_2' + 0.5x_2 + 2x_1 = 0$$

By making these substitutions, the original second-order ODE has become a system of first-order ODEs.

$$\begin{cases} x_1' = x_2 \\ x_2' = -2x_1 - 0.5x_2 \end{cases}$$