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.

\[
\begin{align*}
    x_1' &= x_2 \\
    x_2' &= -2x_1 - 0.5x_2
\end{align*}
\]