

Problem 1: (10 points) Consider the second-order differential equation

$$\frac{d^2y}{dt^2} - 3\frac{dy}{dt} - 10y = 0.$$

Part (a): Convert the differential equation into a system of first-order differential equations by letting $v = \frac{dy}{dt}$.

Part (b): Is $\mathbf{Y}(t) = (y(t), v(t)) = (e^{3t}, 3e^{3t})$ a solution to your system?

Part (c): Find two non-zero solutions that are not multiples of one another to the second-order differential equation $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} - 10y = 0$.