

You must show all your work to receive credit. Calculators are allowed.

**Problem 1:** (3 points) Find the values of  $k$  (a constant) so that  $y = e^{kx}$  solves the differential equation

$$y''' - 4y'' + 3y' = 0$$

Solution:

$$y = e^{kx}, \quad y' = ke^{kx}, \quad y'' = k^2e^{kx}, \quad y''' = k^3e^{kx}$$

$$k^3e^{kx} - 4k^2e^{kx} + 3ke^{kx} = 0$$

$$e^{kx}(k^3 - 4k^2 + 3k) = 0$$

$$k^3 - 4k^2 + 3k = 0$$

$$k(k^2 - 4k + 3) = 0$$

$$k(k - 3)(k - 1) = 0$$

$$k = 0, 3, \text{ or } 1.$$