

Please show and explain your work where necessary. Good luck!!

1. (6 points) Is a unique solution guaranteed to exist for the following initial value problems on the given intervals. Explain your answers.

a. (2 pts) $\ln(x)y''' + \frac{e^x}{x-4}y' - y = \cos(x); \quad y(2) = 1, \quad I = (0, 3).$

b. (2 pts) $\ln(x)y''' + \frac{e^x}{x-4}y' - y = x^2; \quad y(3) = 1, \quad I = (2, 4).$

c. (2 pts) $\ln(x)y''' + \frac{e^x}{x-4}y' - y = x^2; \quad y(2) = 1, \quad I = (1, 3).$

2. (2 points) In your own words, describe what it means for functions to be *linearly independent*.

3. (2 points) Provide an example of the following:

a. (1 pt) A 3rd order linear homogeneous differential equation.

b. (1 pt) A 2nd order linear nonhomogeneous differential equation.