Part B) (10 points)

You are given an axial loading model, M, that predicts the axial deformation of an object, $\delta(x)$, that results from applying a distributed load, $\omega(x)$. You are also informed that the model, M, is a linear system that satisfies the properties of superposition. Furthermore, you have been given the following deformations that result from applying two distinct loads to the object:

$$\delta_1(x) = M[\omega_1(x)]$$
$$\delta_2(x) = M[\omega_2(x)]$$

You must answer the following questions in terms of this given information.

1) If you apply twice the first load, $\omega_1(x)$, to the object, what does the model predict the deformation will be?

$2\,\delta_1(x)$

2) If you apply the two loads, $\omega_1(x)$ and $\omega_2(x)$, to the object at the same time, what does the model predict the deformation will be?

$\delta_1(x) + \delta_2(x)$

3) If you apply a billion, 10^9, times the first load, $\omega_1(x)$, to the object, what does the model predict the deformation will be?

$10^9\,\delta_1(x)$

4) With respect to the previous deformation prediction for a billion times the first load, $\omega_1(x)$, what are two real-world phenomena that might result in this being a poor prediction?

Provide 2 non-linear, real-world phemona, like:

1. elastic, yet nonlinear, stress-strain curve at high stress
2. failure of the material at high stress