Think of an object attached to a spring and undergoing damped harmonic motion. The equation of motion describing it is:

$$\frac{d^2x}{dt^2} = -2\gamma\frac{dx}{dt} - \omega_0^2 x$$

where we have defined constants $\gamma = c/2m$ and $\omega_0^2 = k/m$, k being the spring constant, m being the mass of the object, and c being the damping constant for $F_{\text{ait}} = -cv$.

A. Derive this equation from Newton's second law.

B. The object is pulled from equilibrium and released. The object never crosses the spring equilibrium position. Instead, it moves back toward equilibrium, eventually coming to a rest.

   i. How, if at all, does the equation given at the top of the page describe its motion? Explain your reasoning. If it does not, state so explicitly and modify the equation appropriately so that it does.

   ii. Does a graph of the object's position as a function of time ever go through an inflection point? Explain your reasoning.