4. [15 points] A model for the amount of an antihistamine in the bloodstream after a patient takes a dose of the drug gives the amount, a, as a function of time, t, to be $a(t) = A(e^{-t} - e^{-kt})$. In this equation, A is a measure of the dose of antihistamine given to the patient, and k is a transfer rate between the gastrointestinal tract and the bloodstream. A and k are positive constants, and for pharmaceuticals like antihistamine, $k > 1$.

  a. [5 points] Find the location $t = T_m$ of the non-zero critical point of $a(t)$.

  b. [3 points] Explain why $t = T_m$ is a global maximum of $a(t)$ by referring to the expression for $a(t)$ or $a'(t)$.

  c. [4 points] The function $a(t)$ has a single inflection point. Find the location $t = T_I$ of this inflection point. You do not need to prove that this is an inflection point.

  d. [3 points] Using your expression for T_m from (a), find the rate at which T_m changes as k changes.