On my honor, I have neither given nor received any aid on this work, nor am I aware of any breach of the Honor Code that I shall not immediately report.

Pledged: _____

Print Name: _____

Work together with your group to complete this project. Write up your solution as a technical report, using the LaTeX template provided. This project is due Wednesday, September 12, at the beginning of class.

Recall the rising edge model $e(t)$ we discussed in class:

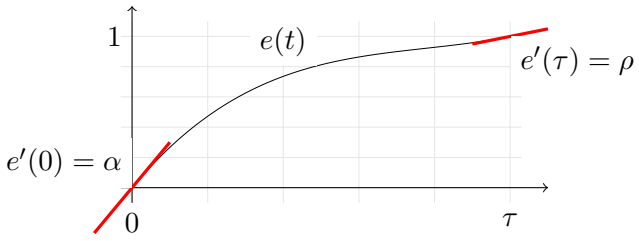

Figure 1. Rising edge $e(t)$, for $t \in [0, \tau]$.

The parameters of the model are the *rise time* τ, the *attack* α, and the *release* ρ. The model requirements are

1. $e(0) = 0$,
2. $e(\tau) = 1$,
3. $e'(0) = \alpha$
4. $e'(\tau) = \rho$

1. Assume a cubic form for the model, i.e.

$$e(t) = a + bt + ct^2 + dt^3$$

   Use the model requirements to solve for a, b, c, and d in terms of the model parameters τ, α, and ρ. Rewrite $e(t)$ in terms of the model parameters.

2. Although we didn't list it as a requirement of the model, obviously we'd like the rising edge to live up to its name; that is, we'd like $e(t)$ to be an increasing function for $t \in [0, \tau]$.
   (a) Prove that if $\alpha \geq 0$, $\rho \geq 0$, and $(\alpha + \rho)\tau \leq 2$, then $e(t)$ is increasing on $[0, \tau]$.
   (b) Are there other values of the model parameters for which $e(t)$ is increasing on $[0, \tau]$? If so, can you find a better (i.e. more complete) description of the set of model parameters for which $e(t)$ is increasing on $[0, \tau]$?