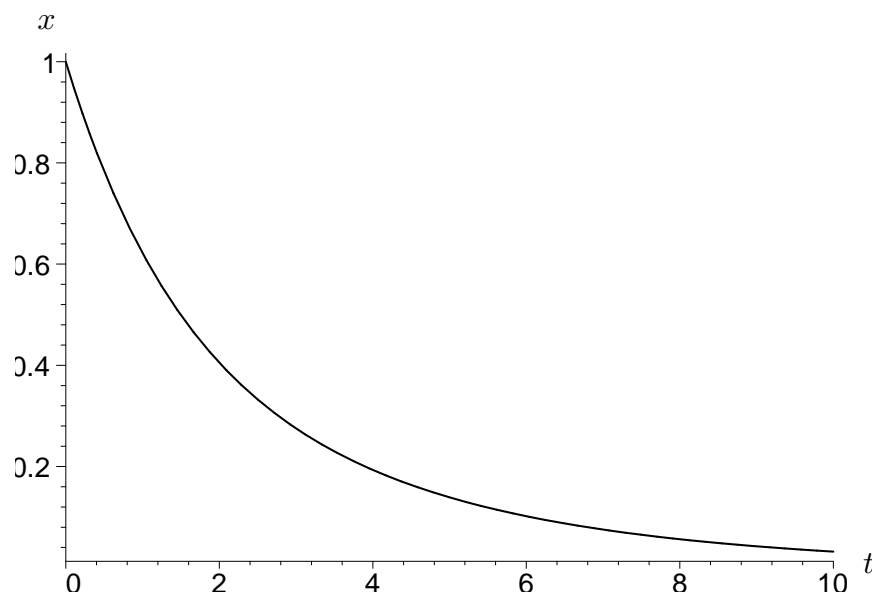


Unforced Circuit

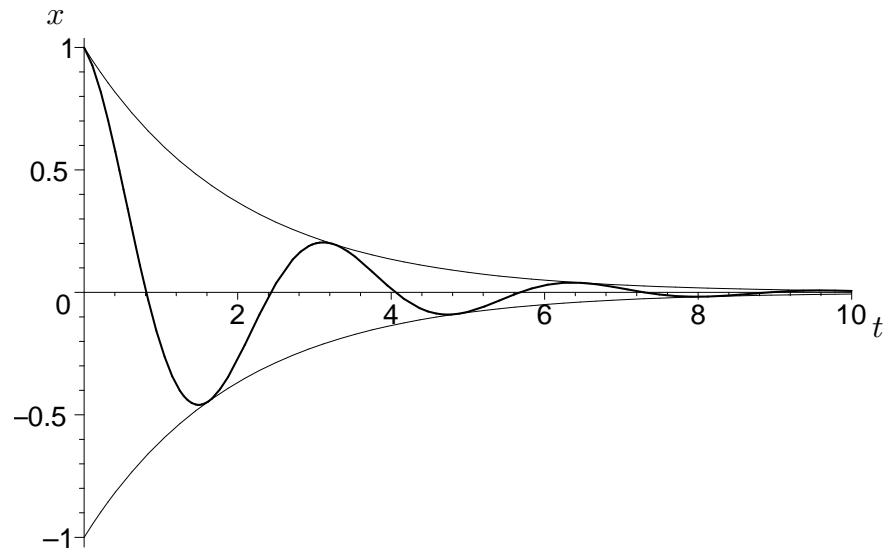
In class we derived the following dimensionless equation for the parallel *RLC* circuit:

$$\ddot{x} + \dot{x} + \alpha x = 0, \quad x(0) = 1, \quad \dot{x}(0) = -1 - \beta.$$



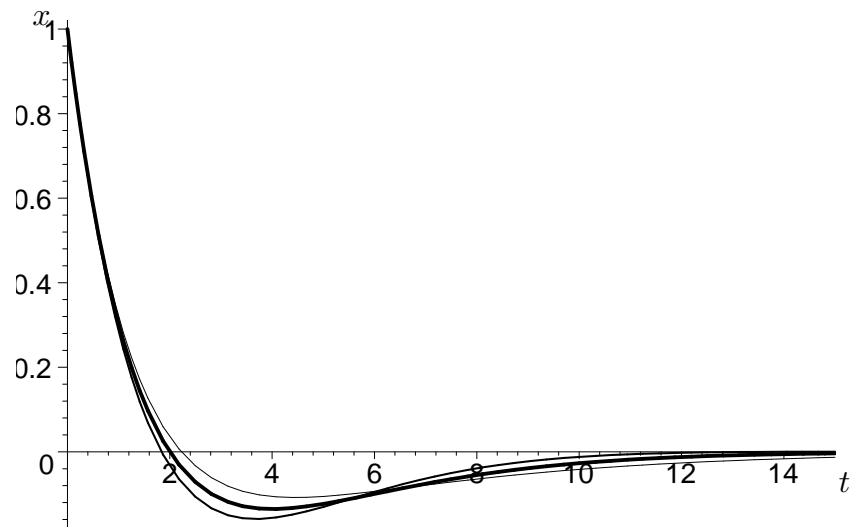
$x(t)$ vs. t for $\alpha = 0.2$, $\beta = -0.5$.

In this case $\alpha < 1/4$, so the solution is overdamped.



Thick line: $x(t)$ vs. t for $\alpha = 4$, $\beta = -0.5$. Thin line: envelopes $\pm e^{-t/2}$.

In this case $\alpha < 1/4$, so the solution is overdamped.



$x(t)$ vs. t for $\beta = 0$ and $\alpha = 0.18, 0.32, 0.25$ (in increasing order of thickness).

Here the thick line is the critically damped case $\alpha = 1/4$, and the other lines show an underdamped and overdamped case with nearby values of α . Note their similarity.