First Order Constant Coefficient Linear ODE's

In this session we start our transition to studying constant coefficient linear ODE's by looking at constant coefficient first order equations. Here we will continue to solve them using integrating factors. Starting in the next session we will learn some simpler methods for solving constant coefficient equations.

We will see that for many physical systems we can split the output (i.e. the solution to the DE) into pieces called the *steady-state* and the *transient*. This will correspond exactly to the way we have already written solutions as a particular solution plus the general homogeneous solution:

$$x(t) = x_p(t) + x_h(t).$$

With the steady-state solution equaling x_p and the transient being x_h.

We have already encountered examples of constant coefficient equations when modeling exponential growth (a bank account), heat diffusion (root beer cooling) and an RC circuit. To finish the session we will add examples of radioactive decay and mixing tanks to this list.

18.03SC Differential Equations
Fall 2011