Homework 1

Due January 18th on paper at the beginning of class. Justify your answers. Please let me know if you have a question or find a mistake. There are some hints on the second page.

- The exercises from `https://www.math.purdue.edu/~kdatchev/495|595/fac.pdf`.

- Borthwick Exercises 3.1 and 3.2. For 3.1 additionally sketch the first quadrant of the (t, x) plane and the regions inside it where u is determined by each of g and h.
  Also, you don't have to hand anything in for this but you might enjoy using Desmos to plot the solutions for some simple choices of constants and functions in the problems.

Hints:

3.1b. Recall that checking a function $u(t, x)$ is C^1 means checking that u, u_t, and u_x are all continuous; in this case checking that the piecewise formulas match up on the interface $x = ct$.

3.2a and 3.2b require solving ODE of the form $y'(t) = a(t)$ and $y'(t) = a(t)y(t)$ respectively, where a is an unspecified function. The first is solved by $y(t) = y(0) + \int_0^t a(s)ds$ and the second by separation of variables.