Homework 34: 11.4 separation of variables

This homework is to be done mostly by hand. Part of 26, 50, and additional problem part (b) is to be done with *Mathematica*. Print and attach your *Mathematica* work.

11.4 textbook problems:

8.

25.

26. Also use *Mathematica* to check using `DSolve`. If the solutions look different, the easiest way to confirm they are the same is to run `Simplify` on the *difference* of the two solutions to see if it is 0. Print your *Mathematica* work.

37.

44. May use formula table.

50. Use *Mathematica* to plot slope fields. First, plot the slope field for positive x and y, then for positive x and negative y, and finally show a particular solution in the positive x and y quadrant with the slope field. When doing this, use something like `{x,0.1,5}` to avoid plotting near $x = 0$. (Why? Write a sentence to explain this.)

Additional problem:

(1) Consider the differential equation $dy/dt = 100 - y$ on page 586 regarding how a person learns.
   (a) Find the general solution by hand.
   (b) Use *Mathematica* to create a slope field and draw particular solutions on the slope field for initial conditions $(0, 0)$, $(0, 20)$, and $(0, 100)$. When plotting, use `{t,0,6}, PlotRange->{0,110}`. Choose the correct order for `Show` to make the output reasonably pretty.
   (c) What do the particular solutions mean in practice? Discuss each solution briefly.
   (d) By looking only at the differential equation, how can we predict the solution when $(0, 100)$ is the initial condition?