MATH 2373.020 – Lecture 7 – 2/11/09

HW4, due Tuesday, February 17:
7598 #1-6
7555 #4-6
7558 #1-3
7564 #2,3
7568 #1,2

HW5, due Thursday, February 19:
7555 #9
7572 #1,2

Exam 1: Thursday, February 19, Tate Lab 150,
5-6 or 6:05 - 7:05

Office hours:

Thurs. 2/12	3-4:15
Fri. 2/13	10:30-11:45
Mon. 2/16	10:30-11:45
Tues. 2/17	1-2:15
Wed. 2/18	10:30-11:45
Thu. 2/19	1-2:15

or by appointment

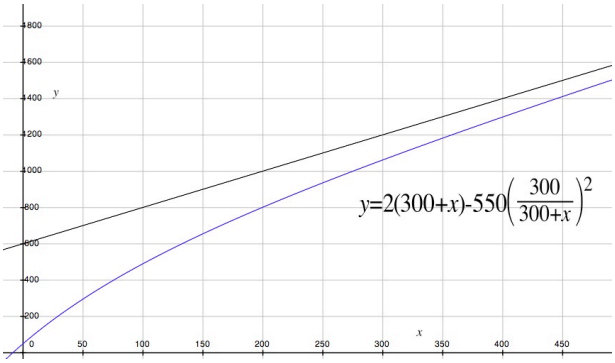
Calendar

2/2	7592 Inverse of a matrix 7552 salt mixture problems: separable DE 7555 RC circuit problems: first order linear DE
2/4	7596 Linear independence 7560 cooling problems 7564 logistic DE
2/9	7598 Least squares 7558 coefficient homogeneous DE
Today:	7555 Salt mixture problems: first-order linear DE 7564 logistic IVP & asymptotic behavior 7568 slope fields review topics...

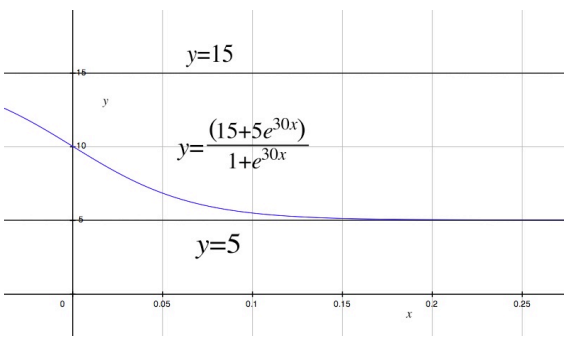
Review topics

coefficient homogeneous DE
least squares
tank draining: separable DE
circuit problems
linear independence
finding inverses using cofactors
finding inverses using Gaussian elimination

Example 1. A large mixing tank initially holds 300 gallons of water, in which 50 pounds of salt has been dissolved. Another brine solution is pumped into the tank at a rate of 3 gal/min, and when the solution is stirred, it is pumped out at a rate of 2 gal/min. If the concentration of the entering solution is 2 lb/gal, find an expression $A(t)$ for the amount of salt in pounds in the tank at time t.



Example 1a. A large mixing tank initially holds 300 gallons of water, in which 50 pounds of salt has been dissolved. Another brine solution is pumped into the tank **at a rate of 2 gal/min**, and when the solution is stirred, it is pumped out at **the same rate of 2 gal/min**. If the concentration of the entering solution is 2 lb/gal, find an expression $A(t)$ for the amount of salt in pounds in the tank at time t.



Example 2. Solve the initial value problem

$$\frac{dy}{dt} = 3(5-y)(15-y),$$

$$y(0) = 10.$$

Also:
- what is the asymptotic behavior of the solution?
- determine whether the equilibrium solutions are stable or unstable.

Example 3. Here is an initial value problem:

$$y^2\frac{dy}{dx} = x^2 + xy,$$

$$y(1) = 1.$$

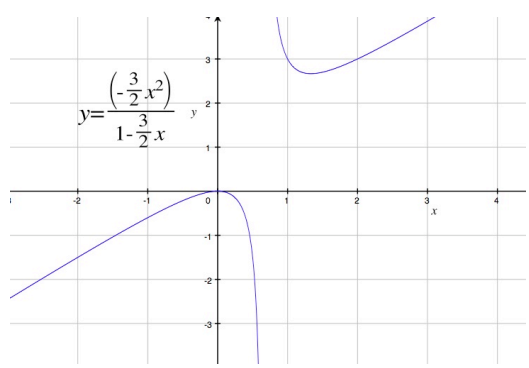
Can you solve it?

Example 3a. Here is an initial value problem:

$$x^2\frac{dy}{dx} = 2xy - y^2,$$

$$y(1) = 3$$

First, begin to sketch a slope field for the differential equation, find a tangent line to the graph of the solution of the initial value problem, and then solve the initial value problem.



“Fun” with least squares