Topics for Midterm 1

Integrating factors

- lecture: Wednesday 1/9
- book: section 2.1
- example problems: 2.1 #7, #8, #15, #20

Separable equations

- lecture: Friday 1/11
- book: section 2.2
- example problems: 2.2 #5, #7
- Know how to find the *domain* of your solution: 2.2 #14(a,c), #16(a,c)
- Remember: with separable equations, you may not be able to solve for $y(t)$ explicitly, and you'll have to leave the solution in implicit form (for instance, $y^3 + y = x + 1$ is in implicit form; $y = x^3 + 1$ is in explicit form.)

Mixing problems

- lecture: Monday 1/14
- book: section 2.3
- example problems: 2.3 #1, #3, #27
- Know how to solve problems where the flow rate in is different from the flow rate out (for instance, 2.3 #4 from the homework, or quiz 2)

Motion problems

- lecture: Wednesday 1/16
- book: section 2.3
- example problems: 2.3 #21, #26
- For problems where force depends on position, remember the trick of substituting $\frac{dv}{dt} = v\frac{dv}{dx}$ (for instance, problems involving springs, or gravity acting on an object far from the earth, like a rocket). Example problem: 2.3 #29(a).

Autonomous equations

- lecture: Friday 1/18, Wednesday 1/23
- book: section 2.5
- example problems: 2.5 #5, #12, #16(a)
- Know how to sketch the phase line and direction field for an autonomous equation without solving it.
- Know how to find equilibrium solutions and classify them as stable, unstable, or semistable.

Other Skills

- Be prepared to analyze solutions as $t \to \infty$ (example problems: 2.1 #30, #33)