Homework 5 UNGRADED: **Math 527, UNH spring 20185**

These are practice problems on variation of parameters and the concept of linearity. You do not have to turn them in.

Problems 1-4. Find the general solution of the differential equation using variation of parameters. If initial conditions are given, also solve the initial value problem. The "prime" notation indicates differentiation with respect to the variable that appears on the right-hand side of the equation. (Note: most of these problems could also be solved by judicious guessing.)

1. $2y'' - 3y' + y = (t^2 + 1)e^{2t}$

2. $y'' + y = \sec t, \quad -\pi/2 < t < \pi/2$

3. $y'' - 3y' + 2y = te^{3t} + 1$

4. $3y'' + 4y' + y = e^{-t}\sin t, \quad y(0) = 1,\ y'(0) = 0$

Problem 5. Give short answers to the following questions.

(a) What property must an operator L satisfy to be *linear*?

(b) Why is linearity important for the solution of linear differential equations?

(c) How many linearly independent solutions does an nth order linear homogeneous equation have?

(d) When you integrate u_1' and u_2' in variation of parameters, why can you always set the integration constant to zero?

(e) What is Euler's formula?

(f) How would you prove Euler's formula? Don't do the proof, just describe the proof in a sentence or two.