18.034, Honors Differential Equations
Prof. Jason Starr
Rec. Suggestions
3/1/04

0. Discuss any issues from the exam you like, I did not review any of the problems in lecture.

1. Solve some 2nd order const coeff. linear homog. ODE's whose char. poly factors over IR.

2. Discuss strategy for solving a 2nd order const. coeff. linear <u>inhomog</u> ODE.

   $y'' + ay + by = f(t)$. If r_1 is a root of $r^2 + ar + b = 0$, then $y(t) = e^{rt}g(t)$ subset leads to $e^{rt}(g'' + (a + 2r_1)g') = f(t)$, $g'' + (a + 2r_1)g' = e^{-rt}f(t)$. Define $h(t) = g'(t)$. Then get linear inhomog. ODE, $h + (a + 2r_1)h = e^{-rt}f(t)$ which can be solved by method of int. factors. Finally antidiff to get g(t).

   <u>Example</u>: $y'' + 2y + y = \cos(t)$. $y = e^{-rt}g(t)$, $\rightsquigarrow$ $g'' = e^{t}\cos(t)$,
   $g(t) = \frac{1}{2}e^{t}\sin(t) + \frac{1}{2}e^{t}\cos(t) + C_2$, $g = \frac{1}{2}e^{t}\sin(t) + C_2 t + C_1$.
   $y(t) = \frac{1}{2}\sin(t) + C_1 e^{-t} + C_2 t e^{-t}$
   (But simpler to guess the particular sol'n $\frac{1}{2}\sin(t)$ and then conclude the general sol'n from the homog. case).

3. Warmup discussion on complex #'s.