Math 2280-1
Tuesday March 30

finish up chapter 5 loose ends! (And look over review sheet for Friday.)

- Monday example of variation of parameters, with computer help, for solving non-homogeneous IVP (§5.6)

$$\begin{cases} \vec{x}\,' = A\vec{x} + \vec{f} \\ \vec{x}(0) = \vec{x}_0 . \end{cases}$$

- Review how to find e^{At} in various cases. - bring notes from Friday before break (march 19), so we can cover pages 3-4.

- The proof that if λ_j has algebraic multiplicity k_j

  then • $G_{\lambda_j} = \ker(A-\lambda_j I)^{k_j}$ has $\dim G_{\lambda_j} = k_j$

  • and that a basis of G_{λ_j} can be constructed out of chains, is also related to the Jordan Canonical form of a matrix
  ↑ google this if you're interested.

  I presented proofs of these facts in my fall 2008 2280 class - see lecture notes from nov. 11
  http://www.math.utah.edu/2280fall08/2280lectures.html.
  if you're interested. (My sense was I had more fun than my class.)

page 2 is exam review sheet.
On Wednesday we will introduce non-linear systems of DE's, chapter 6.
the Thursday problem session will be devoted to going over a practice exam and answering any other exam-related questions you might have

Exam Review

Exam covers 3.5–3.6, 4.1, 5.1–5.6

Chapter 3 3.5–3.6 (skip 3.7)

y_p for $Ly_p = f$ undetermined coeffs & var. parameters

forced oscillations $mx'' + cx' + kx = F_0 \cos\omega t$

$c = 0$ non-resonance, beating, resonance

$c \neq 0$ $x_{sp}(t)$, $x_{tr}(t)$; practical resonance

Using $KE + PE = \text{const.}$ in conservative systems to deduce natural frequencies

7, 25%

Chapter 4 4.1 Theory for 1st order systems of DE's

$\exists!$ thm statement for 1st order IVP (linear case)

converting n^{th} order DE's ~~to~~ (or systems) to equivalent 1st order systems

use $\exists!$ thm to prove dim thm for homog 1st order linear systems of DE's.

how this applies to higher order DE's & systems

7, 20%

Chapter 5 linear systems of DE's

eval-evect method for solving $\vec{x}' = A\vec{x}$

tank modeling

related method for $\vec{x}'' = A\vec{x}$

undamped spring systems

$\vec{x}_p$ for $\vec{x}'' = A\vec{x} + \vec{b}\cos\omega t$ if A arises from undamped spring sys.

FMS $\Phi(t)$; e^{At} ~ different ways to find e^{At}

what to do with defective eigenvalues

variation of parameters for find $\vec{x}_p$, or solving IVP $\begin{cases} \vec{x}' = A\vec{x} + f \\ \vec{x}(0) = \vec{x}_0 \end{cases}$

undetermined coeffs for $\vec{x}_p$.

7, 50%

I like to ask questions which tie together key concepts.