Math 2280-1
Wed 26 April

- Final exam Monday May 1, 8-10 a.m. in our classroom LCB 121 (you'll have until 10:30)
- Review session to go over practice exam &/or other questions is Saturday (29 April), 10-12 noon, also in LCB 121
- Practice exam sol'ns will be posted by Friday morning,
  - last hw sol'ns will be posted at Friday noon, when they ~~hw~~ is due

Exam is inclusive, somewhat weighted on later material

Chapters 1-3 20-30%
Chapters 4-6 30-40%
Chapter 7 15-20%
Chapter 9 20-25%
} this is new since 2nd midterm

topics:

1-2: 1st order DE's
- slope fields, phase portraits
- equil. sol'ns
  - stability
- methods
  - separable
  - linear
- applications
  - populations
  - velocity-acceleration
  - tanks

3: linear DE's
- theory
  - IVP ∃!
  - homog. linear
  - non-homog linear
  - undet'd coef's
  - ~~var pars~~
- applications
  - springs
    - undamped, damped, forced
    - resonance, practical resonance

4: 1st & 2nd order systems of DE's.
- conversion of higher order DE's or systems to 1st order
- ∃! for 1st order linear systems
  - dim of homogeneous (1st order linear) sol'n space
- tank, spring models

5. $\frac{d\vec{x}}{dt} = A\vec{x} + \vec{f}$
- $\vec{x}''(t) = A\vec{x} + \vec{f}$
- $e^{\lambda t}\vec{v}$, cases, Euler | springs & tanks !!
  - ~~chains~~
- $\cos \omega t \, \vec{v}$
- e^{At}
  - ~~var pars~~

6. Phase plane
- equilibria
- linearization & stability
- phase portraits
- population models
- springs & pendulums

7. Laplace transform
- def.
- using table & verifying entries
- IVP's for DE's & systems
  - esp. via partial fractions
  - ~~convolution~~

9. Fourier series & applications
- Fourier coef's & series
- sine & cosine series
- springs revisited
- IBVP for heat eqtn
- " for wave eqtn
- separation of variables,
  - i.e. using superposition of product sol'ns to solve IBVP's.

In addition to the kinds of problems you've come to expect,
I may ask you to explain (or prove) key ideas related to

- linearization
  - hypothesized force functions (Hooke's law, linear drag & damping)
  - linearization near equilibria for autonomous systems
- vector space framework for understanding linear DE's (& PDE's)
  - solution to $L(y)=f$ is $y=y_P+y_H$
  - superposition principle (is just a restatement of linearity!)
  - relating $\exists!$ theorems to dimension of sol'tn space for homog. linear DE's & systems of DE's
- algebra & calculus of exponentials & trig
  - Euler
  - addition angle formulas
  - amplitude/phase
  - e^{At}