700 • (desired %) = total points needed

Total points needed
– 4 undropped exams
– quiz percent
Points needed on final (out of 200)

Review for the Final

- Verifying a solution to a DE
- Verifying linear independence (Wronskian)
- Slope field

- Using critical points to sketch phase portraits and solution curves

Ex. $\frac{dy}{dx} = 4 - y^2$

- Separable equations

Ex. $\frac{dy}{dx} = y(x+1)$

- First order linear DE: $y' + P(x)y = f(x)$
  - Integrating factor $e^{\int P(x)dx}$

Ex. $(x^2 - 9)y' + xy = 0$

- Exact equations
  - Verify, then solve

Ex. $2xydx + (x^2 - 1)dy = 0$

- Bernoulli equation: $y' + P(x)y = f(x)y^n$
  - Substitute $u = y^{1-n}$
- Euler's Method for numerical approximation
- Fundamental Set, General Solution
  - An n^{th} order DE has n linearly independent solutions

- Reduction of order for $y'' + P(x)y' + Q(x)y = 0$
  - $y_2 = y_1 \int \frac{e^{-\int P(x)dx}}{(y_1)^2} dx$
- Homogeneous DE with constant coefficients

Ex. $y'' - 6y' - 7y = 0$

- Non-homogeneous using undetermined coefficients

Ex. $y'' - 6y' - 7y = 4e^{-x}$

- Non-homog. using variation of parameters

Ex. $4y'' + 36y = \csc 3x$

- Cauchy-Euler: $ax^2y'' + bxy' + cy = 0$
  - $am(m-1) + bm + c = 0$

Ex. $x^2y'' - 2xy' - 4y = 0$

- Applications
  - Writing a DE from a word problem
  - Brine!
  - Exponential Growth and Decay
  - Newton's Law of Cooling and Warming
  - Circuit problems
  - Motion problems
  - Spring problems

- Power Series Solutions
  - Ordinary Point

$$y = \sum_{n=0}^{\infty} c_n x^n$$ ← index changes

  - Regular Singular Point

$$y = \sum_{n=0}^{\infty} c_n x^{n+r}$$ ← index doesn't change

- Laplace Transforms
  - Finding a transform
  - Finding an inverse transform
  - Using to solve a DE

Ex. $y'' - 3y' + 2y = e^{-4t}$, $y(0) = 1$, $y'(0) = 5$

- Matrices and Eigenvalues
- Solving linear systems

If you would like your final exam mailed to you, please bring a self addressed, stamped envelope with you to the final.