Math 211

- Classes: Mon, Wed, Fri; 10:00--10:50. Classes start Mon Aug 25.
- Location: Mathematical Sciences Building, M-303.
- Office Hours: Mon, Wed, Fri; 11:00--12:00.
- Exams:
  - **The first midterm will be held on Wednesday the 1st of October.** Practice questions are here.
  - **The second midterm exam will be held on Wednesday 22nd of October.** Practice questions are here.
  - **The final exam will be held on Tuesday the 9th of December between 10:30 AM and 12:30 PM in MSB 303.** Practice questions are here.
- Homework: Will be set once a week on Friday -- to be handed in the following Friday.
- Syllabus:
  - Textbook: Differential Equations, third edition; by Blanchard, Devaney and Hall.
  - Outline: The purpose of this course is to develop the basic theory of differential equations and apply this to some examples drawn from physics and elsewhere. You will learn methods for finding exact solutions to certain specific types of differential equation as well techniques to describe the behaviour of solutions to differential equations for which explicit formulae are difficult or impossible to find. The topics that I intend to cover are:
    - 1.1 Modelling via differential equations
    - 1.2 Analytic technique: separation of variables
    - 1.3 Qualitative technique: slope fields
    - 1.4 Numerical technique: Euler's method
    - 1.5 Existence and uniqueness of solutions
    - 1.6 Equilibria and the phase line
    - 1.7 Bifurcations
    - 1.8 Linear equations
    - 1.9 Integrating factors for linear equations
    - 2.1 Modelling via systems
    - 2.2 The geometry of systems
    - 2.3 Analytic methods for special systems
    - 2.4 Euler's method for systems
    - 3.1 Properties of linear systems and the linearity principle
    - 3.2 Straight-line solutions
    - 3.3 Phase planes for linear systems with real eigenvalues
    - 3.4 Complex eigenvalues
    - 3.5 Special cases: repeated and zero eigenvalues
    - 3.6 Second order linear equations
    - 5.1 Equilibrium point analysis
    - 6.1 Laplace transforms
    - 6.2 Discontinuous functions
    - 6.3 Second-order equations
    - **Note:** This syllabus may be subject to modest alterations in content as the semester progresses.
  - Assesment:
    - Homework assignments will contribute to 10% of your grade. It is important that you hand them in **on time**.
    - There will be two mid-sessional exams. The first will be worth 20% and the second will be worth 30%.
    - There will be a final exam, which will be worth 40%.
- Q-center: Are you struggling in the course? A limited amount of help is available from the Q-center

(and from me during my office hours, of course).

- Additional resources:
  - **Software** for, amongst other things, sketching slope fields is available for free from here.
  - Section 1.3: The slope field for the equation dy/dt=y(y-3)+t which we drew in class is here.
  - Section 1.4: The slope field for the equation dy/dt=exp(t)sin(y) for which Euler's method failed is here.
  - Section 1.5: The slope field for the equation dy/dt=(y-t)^2+1 which we drew in class is here.
  - Section 1.8: A sketch of the solutions to the equation dy/dt=-2y+cos(t) which we looked at in class is here.
  - **Software** for sketching vector fields and phase portraits is available for free from here.
  - The phase portrait for the system dx/dt=x(y-1), dy/dt=y(x-2) which we sketched in class is here.
  - The phase portrait for the damped harmonic oscillator considered in class is here.
  - Section 5.1: The phase portrait of the nonlinear system we looked at in class and its linearisation.
  - Section 5.1: The phase portrait of the linear system with trigonemetric functions we looked at in class.
  - Section 5.1: Equilibrium point analysis of the predator prey model we discussed in class.
  - Section 5.1: Here is an example of two systems, A and B, with different qualitative behaviour but the same linearisation.

Homework

Questions set	**Due**
1.1 Q2, 4. 1.2 Q8, 14, 24, 30.	Fri Sep 5th.
1.3 Q8, 16. 1.4 Q6, 8.	Fri Sep 12th.
1.5 Q14. 1.6 Q8, 24 32, 36.	Fri Sep 19th.
1.7 Q6, 8. 1.8 Q4, 6, 8, 10.	Fri Sep 26th.
2.1 Q2, 6, 8. 2.2 Q10, 12. 2.3 Q18.	Fri Oct 10th.
2.4 Q10. 3.1 Q6, 16. 3.2 Q4, 12.	Fri Oct 17th.
3.3 Q2, 6. 3.4 Q4, 8, 10.	Fri Oct 31st.
3.5 Q2, 6, 18. 3.6 Q2.	Fri Nov 7th.
5.1 Q4, 6.	Fri Nov 14th.
6.1 Q2, 8, 12, 16. 6.2 Q2, 4, 10.	Fri Nov 21st.

Back to homepage