Math 5610/6860 Projects

- You need to choose a group of 2-3 and a project by Nov 7 and **notify me** by email of your choice. You may belong to only one group.
- Write one **project report** per group. This is **due Thu 12/9** (last day of classes). The report can be handwritten or typed, I have no preference. You should explain with your own words the problem and the method. For full credit you need to **include your numerical results and the code you used** to generate them. There are no proofs involved in the suggested problems.
- I expect the amount of work for each of these projects to be between one and two homeworks. If you feel the project is taking longer, please come see me as it probably means you are not approaching the problem correctly. If you have doubts about something or would like to know what I am expecting from each project, **please ask!**.

Possible projects

1. Bézier curves. Ref. B&F 3.5. **Objectives**: What are they and what are they used for? Implement algorithm and demonstrate by drawing e.g. a letter.
2. Approximate the integral of **a function of two variables** when the integration region is not necessarily rectangular but has the form (4.42) (or (4.43) see p241 in B&F). **Objectives**: You need to implement both Gaussian and Simpson composite quadrature rules and compare their performances on **two** different cases where the double integral can be evaluated exactly. Ref. B&F 4.8
3. Gaussian quadrature. Ref. B&F 4.7. **Objectives:** you need to write a code that implements the three term recurrence for Legendre polynomials, computes their roots and the weights in the Gaussian quadrature formulas. You are not allowed to use the `roots` or `polyval` Matlab functions. The weights are obtained by integrating some Lagrange interpolation polynomials. You can write a program that produces their coefficients and from there it should be easy to compute the weights. It may be easier to use the undetermined coefficients method. You should produce a table similar to B&F Table 4.12 but with $n = 2, \ldots, 10$.
4. Your own project. However you need to see me to make sure that we agree on the project problem and objectives. This is to make sure that your project is related to the class and takes the right amount of time.