

**Instructions:** Do your own work. You may consult your class notes and the course text. Do not consult other sources. Do not discuss generalities or specifics of the exam with anyone except me.

Turn in a complete and concise write up of your work. Show enough detail so that a peer could follow your work (both computations and reasoning). All plots should be carefully drawn either by hand or printed from technology. If you want to include a visualization that cannot be printed (such as an animation), include it as an attachment in an email with “Math 302 Exam 7” as the subject line.

The exam is due in class on Thursday, November 4.

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Consider  $f$  defined on  $[-1, 1]$  by  $f(x) = x^3$ . Compute the expansion of  $f$  in terms of the orthogonal set  $\{\sin(k\pi x)\} \cup \{\cos(k\pi x)\} \cup \{1\}$  and then analyze convergence of this orthogonal expansion. As part of this, give a visualization of the convergence of this orthogonal expansion and describe how the orthogonal expansion does or does not converge to  $f$  on  $[-1, 1]$ .