

2nd homework for ma798k: Due on April 24, 2008.

Directions: Do at least the first 4 of these problems. Doing problem 5 and/or 6 will make you a much better person.

1. Find f so that $u(x) = e^x \sin(\pi x)$ is the solution to $-u'' = f$, $u(0) = u(1) = 0$. You'll be solving this problem for the entire assignment.
2. Write a multiplicative Schwarz solver. Vary the overlap and h and see how it performs. In particular for $h = 1/32, 1/64$, and $1/128$, consider overlaps of 1, 2, 10, and $\text{floor}(.1/h)$.
3. Use your multiplicative Schwarz code as a preconditioner. With $h = 1/32, 1/64$, and $1/128$, consider overlaps of 1, 2, 10, and $\text{floor}(.1/h)$ show how the convergence depends on h and the overlap.
4. Write a one-level additive Schwarz preconditioner and do the overlap and h study as in the previous problem.
5. Write a two-level additive Schwarz preconditioner and do the overlap and h study as in the previous problem. There are several ways to handle the coarse level, pick one and explain your decision.
6. Write a two-level hybrid additive Schwarz preconditioner and do the overlap and h study as in the previous problem.