1. Arfken, Chapter 7, page 377: problems 7.7.2, 7.7.4.

2. Arfken, Chapter 8, pages 387, problems 8.2.2, 8.2.5.

3. Show that the linear operator $L = -d^2/dx^2$ on $L^2([0, 1])$ is hermitian on the functions that vanish at $x = 0$ and at $x = 1$ and that are twice differentiable. That is, for any two such functions

$$\int_0^1 \overline{f}(x)(Lg)(x) \ dx = \int_0^1 \overline{Lf}(x)g(x) \ dx.$$

Find some eigenfunctions of L, that is, functions satisfying $Lf = \lambda f$, with these properties.