1. (10 points) Find $A_{nm}$ in the following equation valid on the domain $0 \leq x \leq L$, $0 \leq y \leq W$. Then make a surface plot of both sides of the equation to show they are equal (only sum up to $n = 10$ and $m = 10$).

$$H(x - L/4)H(y - W/2) = \sum_{n=1}^{\infty} \sum_{m=0}^{\infty} A_{nm} \sin \left( \frac{n\pi x}{L} \right) \cos \left( \frac{m\pi y}{W} \right)$$

2. (10 points) Write the function $\delta(x)$ on the domain $-1 \leq x \leq 1$ in terms of Chebyshev polynomials of the first kind. Here $\delta(x)$ is the Dirac delta function function. To do this, you don’t need to know what a Chebyshev polynomial is, but you need to know a few of it’s properties. You need to know that the $n^{th}$ order Chebyshev polynomial of the first kind is represented as

$$T_n(x),$$

and that if we let $n$ be any non-negative integer they form a complete orthogonal set on this domain subject to the weight $1/\sqrt{1-x^2}$ such that if either $n \neq 0$ or $m \neq 0$ then

$$\int_{-1}^{1} \frac{1}{\sqrt{1-x^2}} T_n(x) T_m(x) dx = \frac{\pi}{2} \delta_{n,m}$$

and

$$\int_{-1}^{1} \frac{1}{\sqrt{1-x^2}} [T_0(x)]^2 dx = \pi \delta_{n,m}.$$ 

3. (10 points) Look through the homework, find a topic you need to review, and write a problem based on that topic. Work the problem.

4. (10 points) Make sure that all of your homework, exams, and quizzes are recorded correctly online, and email Dr. Durfee if you find any errors. Then, after you do this, write “Yes, I did it” on your homework for full credit for this problem. Oh, and this would probably be a good time to do the course evaluation if you haven’t yet.