ECEn 560
Electromagnetic Wave Theory

Homework #18
Due March 22, 2016 (may be turned in late for half credit)

1. Find the far field radiated by a uniformly illuminated rectangular aperture antenna. It is convenient to center the aperture on the origin, so that it is defined by $-a/2 \le x \le a/2$, $-b/2 \le y \le b/2$.

2. (a) Find the far field radiated by an open-ended rectangular waveguide excited in the dominant mode. As in the previous problem, it is convenient to center the waveguide at the origin, in which case the aperture electric field is $\overline{E} = E_0 \hat{y} \cos(\pi x/a)$. (b) Find the aperture efficiency of this antenna.

3. (a) Find the electric far field radiated by a circular aperture antenna radius a and uniform excitation. (b) Use this to find the gain and effective area of the antenna. The identity $\int_0^a J_0(bx)x\,dx = \frac{a}{b}J_1(ab)$ will be useful.