

### Set 6—due 13 October

The midterm will be Tuesday, October 10, 7-830 PM, in G-131.

“If you’re very good at calculus you could probably figure out a way to do it without thinking” – F. E. Low

1) [20 points] Write down the Dirichlet Green’s function for electrostatics for a two-dimensional square of length  $a$ , ( $0 < x < a$ ,  $0 < y < a$ ), expanding in sine waves with a double sum, like in Eq. 3.167. Now suppose that the potential is specified to be  $V = 0$  on all sides except the side at  $y = a$  and  $\Phi(x, a) = V(x)$ . Work out down the appropriate formula for  $\Phi(x, y)$  and look at it – does it not seem to show peculiar behavior as  $y \rightarrow a$ ? To be definite, set  $V(x) = \sin(\pi x/a)$ , do the integral, and you’ll find  $\Phi(x, y) = \sin(\pi x/a)F(y)$ . Plot partial sums of  $F(y)$  (summing say the first  $n$  terms). What’s going on? Are there alternate version of Green’s functions which will not show this behavior?