Homework #11:

1-2) Brooker 14.2. You can work this by chopping the fiber up into sections of thickness $\Delta z$, then finding the ABCD law for each $\Delta z$ by finding multiplying an ABCD matrix for a lens by that of propagation $\Delta z/n_0$. Neglect terms of order $\Delta z^2$ in your ABCD matrix.

3-4) Plot the electric field as a function of position for a single mode “sandwich” with $V=1.5$. What value of the minimum Gaussian waist most closely matches the electric field of the fiber? Add the Gaussian to the plot.

5) Find the relationship between numerical aperture and V-number. If a lens of focal length $f$ and diameter $d$ is used to collect light from the fiber, what fraction of the light will be collected?

6) Light emerging from a multi-mode fiber is collected by a lens of focal length $f$. What is the diameter of the resulting spot in the focal plane of the lens? Your answer will depend on the wave-length and the V-number as well as $f$. 