Nonlinear Optics
Homework 6
due Wednesday, 18 March 2009

- **Problem 1:**
  Boyd problem 4.3

- **Problem 2:**
  Boyd problem 4.6
  Use the parameters on page
  By solving the heat equation in steady state, you should find that the temperature profile (and therefore the induced refractive index profile) is parabolic. This parabolic profile acts as a lens. Assume that the rod is short enough so that we can treat it as a thin lens, which has a phase profile:
  $\phi(r) = -k\, r^2 / 2\, f$.
  Calculate the phase shift after propagation through the rod, then compare your expression to that of a thin lens, thereby calculating the effective focal length of the thermally induced lens.
  For typical parameters, use:

```
cm = 0.01 m; W = 1; Kv = 1;
Qin = 10 W / cm^3;
κ = 1. W / (m Kv);
a = 1 cm;
len = 1 cm;
dndT = 10^-5 / Kv;
```

- **Problem 3**
  Boyd problem 4.7, parts (a) and (b).

- **Problem 4**
  Boyd, problem 4.8
  Here you assume that the intensity dependence of the beam is unaffected by the nonlinearity (use the Gaussian beam formula for the variation of the beam size with position).