Homework #2

1. Re-plot
   a) Figure 2.6 for $\gamma = 0$ and $\gamma = 2$
   b) Figure 2.9 for $m = 0, 1, 2, \ldots, 6$, $0 \leq b \leq 1$, and $0 \leq v \leq 10$

2. According Fig 2.2, consider a slab waveguide which has the structure with $2a = 8 \ \mu m$, $n_c = 1.5032$, $n_0 = n_s = 1.5$, at $\lambda = 1.55 \ \mu m$

   a) according to Eq (2.21), please calculate the normalized propagation constant $b$ and the effective refractive index $n_{eff}$ of the TE fundamental mode.

   b) according to Eq. (2.7), please plot the electric field distribution $E_y(x)$ for $-25 < x < 25$.

   c) plot the optical intensity distribution (i.e. $|E_y(x)|^2$) for $-25 < x < 25$.

3. Calculate the effective refractive index of the TE fundamental mode for a ridge-type waveguide as defined in Fig. A at $\lambda = 1.55 \ \mu m$.

4. Calculate the divergence angle ($\theta_x$ and $\theta_y$) of the radiation field from a semiconductor laser diode as defined in Fig. B at $\lambda = 1.55 \ \mu m$ where $w_x = 0.92 \ \mu m$, $w_y = 0.37 \ \mu m$ are calculated using finite element method.