Homework 4

Write a simple MATLAB (MAPLE, Matematica) that can numerically solve balance equations

$$\frac{dn_2}{dt} = \frac{1}{\tau_2}(p - n_2 - n_2 n_p)$$

$$\frac{dn_p}{dt} = \frac{n_p}{\tau_p}(n_2 - 1)$$

step by step for the time-dependent pump function p(t). Then plot the population inversion $n_2(t)$ and photon density $n_p(t)$ versus time (in units of photon life time) for different ratios of τ_2/τ_p (say 0.1,1,100, or your choice) for Gaussian pump pulse $p(t) = p_0 e^{-t^2/t_p^2}$ with a few different peak powers (say p_0=1,5,10) and a few different pulse lengths t_p (choose the latter to have interesting and meaningful results). Explain what you see on the plots.

MATLAB has ode45 program that can integrate ordinary diff. Equations, but you can write your own program.