Homework #3

1. Draw lines of constant $dE/dt$ in the pulsar $P - \dot{P}$ diagram, and find the pulsar with the highest observed value of $dE/dt$. What are the characteristic age and $B$-field of this pulsar?

2. Estimate the spin period of the Crab pulsar at the time of its birth in the supernova of 1054 AD. The present period of the pulsar is $P = 0.0334$ s, and $\dot{P} = 4.20 \times 10^{-13}$ s $s^{-1}$. Do the calculation under each of the following assumptions:

   (a) Averaged over time, the spindown rate $\dot{\Omega}$ was always proportional to $-\Omega^n$, with the braking index $n = 3$ in the magnetic dipole approximation.

   (b) The braking index has always been $n = 2.51$, the currently measured value.