1. The $\tau^-$ lepton decays in several different ways. For each of the decay product/s below, figure out the accompanying neutrino/s and draw the Feynman diagrams
a) electron or a $\mu^-$ (roughly 20% each).
b) $\pi^-$ meson ($\bar{u}d$)(about 10%).
c) $\pi^-\pi^0$ (about 25%).
d) The decay mode in (c) is more frequent because it happens via the $\rho^-$ meson (which is also $\bar{u}d$, so the diagram for it is the same as in (b)). The $\rho$ is a broad resonance that decays to $\pi^-\pi^0$. Draw a diagram for this $\rho$ decay. (There is nothing new here once you get (c).)

2. The color force is attractive when the $q\bar{q}$ system is in the SU(3) singlet configuration and repulsive in the octet configuration. We showed this in class by evaluating the color factors for the $B\bar{B}$ part of the singlet state and for the $R\bar{G}$ and $R\bar{B}$ octet states. Repeat these calculations for the
(a) $R\bar{R}$ and (b) $G\bar{G}$ parts of the singlet state and
(c) for the $G\bar{B}$ octet state.
As we did in class, for each calculation go through all the eight gluons and pick the relevant ones. You should find four each for (a) and (b) and only one for (c). In each case, you should get the same value that we got in class.