Practice Problems Related to the Saha Equation

Write a code to compute, and plot,

$$\log_{10}\left(\frac{y^2}{1-y}\right) \tag{1}$$

over a range of temperatures from $T = 10^3$ K to $T = 10^6$ K, in logarithmic steps $d\log_{10} T(\mathrm{K}) = 0.1$ for $\rho = 10^{-31}$ g cm^{-3} (roughly the average baryon density of the universe, $\rho = 10^{-24}$ g cm^{-3} (representative of the average density of the interstellar medium), and $\rho = 10^{-16}$ g cm^{-3} (a reasonable density for a core of a molecular cloud). What trends do you see, and how would you explain them?