(Angular size of horizon at last scattering)

(a) Compute the maximum angular separation of two points on the surface of last scattering (SLS) that are "in causal contact", i.e. whose past light cones intersect before the big bang. Assume a flat, matter-dominated FRW model all the way back to the big bang. Give both the exact result and the leading order approximation neglecting higher order terms in $1/z_{ls}$. (b) Next do the calculation assuming a flat, matter plus radiation plus vacuum energy model, with $\Omega_m = 0.3$, $\Omega_r = 8 \times 10^{-5}$, and $\Omega_v = 1 - \Omega_m - \Omega_r \approx 0.7$. (c) Compare the results for (a) and (b) and explain why they are fairly close to each other, which one is larger, and why.