Also with $\frac{R(t_0)}{R(t_d)} = 1100$

$$\rho_d = \rho_0^M \left(\frac{R_0}{R_d}\right)^3 + \rho_0^r \left(\frac{R_0}{R_d}\right)^4$$

$$= 10^{-9} J/m^3 (1100)^3 + 10^{-13} J/m^3 (1100)^4$$

$$= (1.331 + 0.14641) J/m^3$$

$$= 1.47741 J/m^3$$

With $k=0$ in Eq (3) (R then becomes irrelevant)
with $H(t_d) = 5.26314 \times 10^{-14} s^{-1}$

$$\rho = N\left(H^2 + \frac{kc^2}{R^2}\right) \therefore \rho_d = N\left(H_d^2 + \frac{kc^2}{R_d^2}\right)$$

$$\rho_d = 1.6077 \times 10^{26} kg m^{-1} \left((5.26314 \times 10^{-14} s^{-1})^2 + \frac{0 \times c^2}{R_d^2}\right)$$

$$= 0.44534 J/m^3$$

Rest of this part answered overleaf.

(I have gone to all this effort because I think it is unclear what the question wants.

(If the universe is closed, then it will have expanded less since decoupling than for a critical universe, so for given values of ρ_0^r and H_0, ρ_d for a closed universe will be less than for a critical universe using the methods I have shown.

In parts (iii) and (v) we calculated $R(t_0)$, $R(t_d)$ and $\frac{R(t_0)}{R(t_d)}$ for a closed universe, and in part (vi) using $H = \frac{2}{3t}$ (and finding that $\frac{R(t_0)}{R(t_d)} = \left(\frac{t_0}{t_d}\right)^{2/3}$) we found t_d, but $\frac{R(t_0)}{R(t_d)} > 334.73$ for a critical universe since deceleration is less between t_d to t_0. If we use $\frac{R(t_0)}{R(t_d)} = z+1$, where z is the redshift experienced by the background radiation