$Mpc := 3.086 \cdot 10^{22} \cdot m \qquad c := 2.9979 \cdot 10^{8} \cdot m \cdot s^{-1} \qquad H0 := 67.4 \cdot \frac{km}{s \cdot Mpc} \qquad G := 6.674 \cdot 10^{-11} \cdot \frac{m^3}{kg \cdot s^2} \qquad \rho c0 := \frac{3 \cdot H0^2}{8 \cdot \pi \cdot G} \qquad a1 := 0.5$

$\Omega b := 0.0496 \qquad \Omega m0 := 0.3149 \qquad \Omega \Lambda := 1 - \Omega m0 \qquad \rho b := \Omega b \cdot \rho c0 \qquad \rho \Lambda := \Omega \Lambda \cdot \rho c0 \qquad \rho m0 := \Omega m0 \cdot \rho c0$

$$a(t) := \left(\sqrt{\frac{\Omega m0}{1 - \Omega m0}} \cdot \sinh\left(3 \cdot H0 \cdot t \cdot \frac{\sqrt{1 - \Omega m0}}{2} \right) \right)^{\frac{2}{3}}$$

$$t0 := \frac{-2}{3} \cdot \frac{\operatorname{asinh}\left[1^{\left(\frac{3}{2}\right)} \cdot \frac{(-1 + \Omega m0)}{\Omega m0} \cdot \sqrt{\frac{\Omega m0}{(1 - \Omega m0)}} \right]}{\left(H0 \cdot \sqrt{1 - \Omega m0} \right)} \qquad t1 := \frac{-2}{3} \cdot \frac{\operatorname{asinh}\left[a1^{\left(\frac{3}{2}\right)} \cdot \frac{(-1 + \Omega m0)}{\Omega m0} \cdot \sqrt{\frac{\Omega m0}{(1 - \Omega m0)}} \right]}{\left(H0 \cdot \sqrt{1 - \Omega m0} \right)} \qquad t := t1, t1 \cdot 1.001 .. t0$$

$$\rho c0 := \frac{3 \cdot H0^2}{8 \cdot \pi \cdot G} \qquad \rho c(a) := \frac{\rho m0}{a(t)^3} + \rho \Lambda \qquad H(a) := \sqrt{\left(\frac{8 \cdot \pi \cdot G}{3} \right) \cdot \rho c(a)} \cdot \frac{Mpc}{km}$$

$$\frac{\frac{\rho m0}{a(t0)^3} + \rho \Lambda}{\rho b} = \frac{1}{\sqrt{1 - 2 \cdot \frac{\frac{4}{3} \cdot \pi \cdot R0^3 \cdot \rho c0 \cdot G}{R \cdot c^2}}}$$

$$R0 := \frac{1}{12 \cdot \pi \cdot \rho c0 \cdot G} \cdot c \cdot \sqrt{-6 \cdot \pi \cdot \rho c0 \cdot G \cdot \left(-9 + 9 \cdot \frac{\rho b^2}{\rho c0^2} \right)}$$

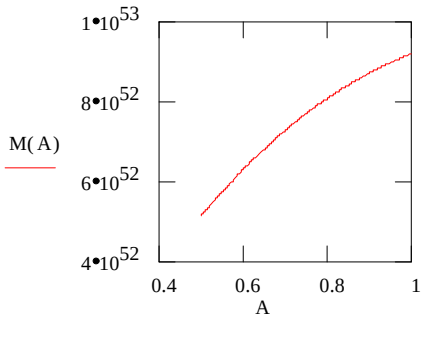
$R0 = 1.371 \cdot 10^{26} \cdot m$

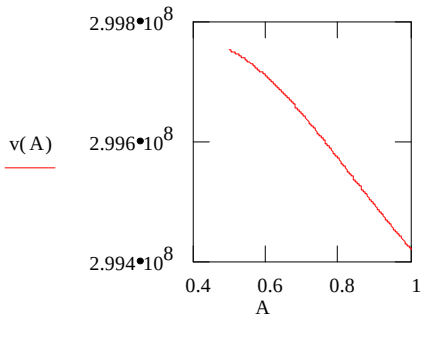
$a(t0) = 1 \qquad A = 1 \qquad A := 0.5, 0.501 .. 1$

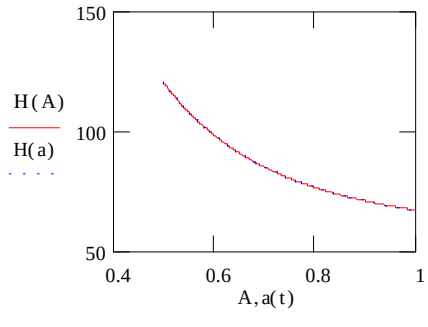
$$\frac{\frac{\rho m0}{A^3} + \rho \Lambda}{\rho b} = \frac{1}{\sqrt{1 - \frac{8}{3} \cdot \frac{\pi \cdot R(A)^2 \cdot \rho c(A) \cdot G}{c^2}}}$$

$$R(A) := \frac{1}{12 \cdot \pi \cdot \left(\frac{\rho m0}{A^3} + \rho \Lambda \right) \cdot G} \cdot c \cdot \sqrt{-6 \cdot \pi \cdot \left(\frac{\rho m0}{A^3} + \rho \Lambda \right) \cdot G \cdot \left[-9 + 9 \cdot \frac{\rho b^2}{\left(\frac{\rho m0}{A^3} + \rho \Lambda \right)^2} \right]}$$

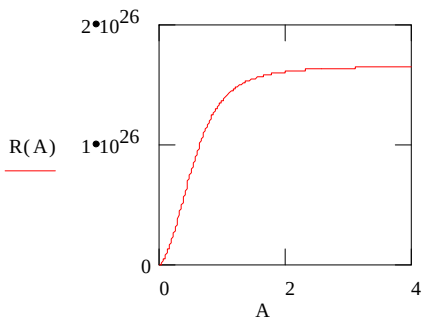
$$M(A) := \frac{4}{3} \cdot \pi \cdot R(A)^3 \cdot \left(\frac{\rho m0}{A^3} + \rho \Lambda \right) \qquad v(A) := \sqrt{\frac{8}{3} \cdot \left[\pi \cdot R(A)^2 \cdot \left(\frac{\rho m0}{A^3} + \rho \Lambda \right) \cdot G \right]} \qquad H(A) := \frac{v(A)}{R(A)} \cdot \frac{Mpc}{km}$$

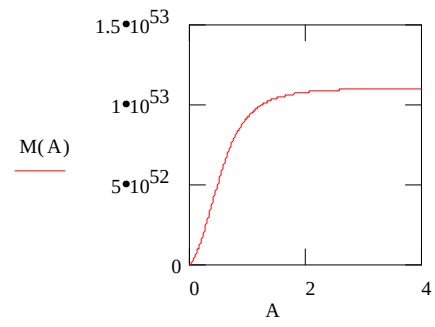


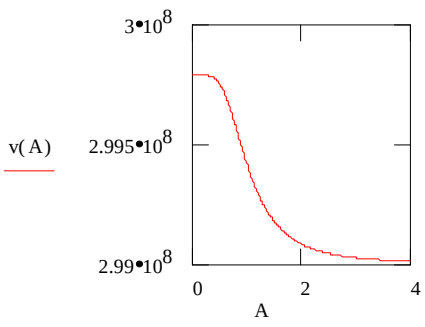




$A := 0.01, 0.02 .. 4$







$R(10) = 1.654 \cdot 10^{26} \cdot m$

$M(10) = 1.108 \cdot 10^{53} \cdot kg$

$v(10) = 2.99 \cdot 10^{8} \cdot m \cdot s^{-1}$

$v(0.01) = 2.9979 \cdot 10^{8} \cdot m \cdot s^{-1}$