Universidad de San Carlos de Guatemala
Escuela de Ciencias Físicas y Matemáticas
Jorge Alejandro Rodríguez Aldana **Course**
201804766 **Guatemala, 16 de julio de 2021**

TITLE

$$\dot{\rho} = -3H(\rho + P)$$

$$H^2 := \left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3c^2}\rho - \frac{kc^2}{a^2}$$

$$P = w\rho$$

$$a(t) = a_o\left[\frac{2}{3}\left(\frac{8\pi G\rho_0}{3c^2}\right)^{\frac{1}{2}}(1+w)(t-t_0)+1\right]^{\frac{2}{3(1+w)}}$$

$$\Delta t = \frac{\frac{2}{3}H_0}{1+w}$$

$$\rho + 3P \leq 0$$

$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3c^2}\rho_0\left(\frac{a}{a_0}\right)^{-3(1+w)} - \frac{kc^2}{a^2}$$

$$g_{tt} = 1 g_{rr} = \frac{a^2}{1-kr}$$

$$\begin{aligned} g_{tt} &= 1 \\ g_{rr} &= \frac{a^2}{1-kr} \\ g_{\theta\theta} &= a^2 r^2 \\ g_{\phi\phi} &= a^2 r^2 \sin^2\theta \end{aligned}$$

$$\begin{aligned} R_{tt} &= -\frac{a\ddot{a}}{a} \\ R_{ii} &= -\frac{g_{ii}}{a^2}\left(a\ddot{a} + 2\dot{a}^2 + 2k\right) \end{aligned}$$

$$R = -6\left[\frac{\ddot{a}}{a} + \left(\frac{\dot{a}}{a}\right)^2 + \frac{k}{a^2}\right]$$

$$T_{tt} = \rho$$
$$T_{ii} = -Pg_{ii}$$

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R - \Lambda g_{\mu\nu} = \kappa T_{\mu\nu}$$

$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{\Lambda}{3} - \frac{k}{a^2}$$
$$\dot{a} = \left(\frac{\Lambda}{3} a^2 - k\right)^{1/2}$$

$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3c^2} \rho_0 \left(\frac{a_0}{a}\right)^{3(1+w)} + \frac{\Lambda}{3}$$