# ASTR 425/525
# Cosmology

## Worksheet #6

Monday 09/08/2025

**Question 1.**

Consider a universe filled with a single component with a constant equation of state $p/\rho = w$. In this case, as we saw last time, the density of such component scales as $\rho = \rho_0 a^{-3(1+w)}$, where $\rho_0$ is the density today.

**(a)** Solve the Friedmann equation (assume $k = 0$) for the scale factor $a(t)$ in such a universe, assuming that $w \neq -1$.

**(b)** Now repeat the calculation for the case that $w = -1$.

**(c)** How does the scale factor behave in a matter-dominated universe ($w = 0$)? How about a radiation-dominated universe ($w = 1/3$)?