Write a code to compute the relation between redshift and the following cosmological quantities: comoving distance D_C , luminosity distance D_L , angular diameter distance D_A , total comoving volume of a sphere out to that redshift V_C , and lookback time t. The code should work for any combination of cosmological parameters that result in a flat universe. The parameters are: the hubble constant h, the matter density parameter Ω_m , the dark energy density parameter Ω_A , and the dark energy equation of state parameter w.

Run your code for the following four cosmological models:

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1. Flat universe, no dark energy: h=1, \Omega_m=1.00, \Omega_{\perp}=0.00
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- 2. Flat universe, "cosmological constant" dark energy: h=1, $\Omega_m=0.25$, $\Omega_{\lambda}=0.75$, w=-1
- 3. Flat universe, dark energy with a high w: $h=1, \Omega_m=0.25, \Omega_s=0.75, w=-0.8$
- 4. Flat universe, dark energy with a low w: $h=1, \Omega_m=0.25, \Omega_{\star}=0.75, w=-1.2$

Make the following four plots, showing all four of the above models in each plot:

- a) comoving distance D_C vs. redshift z
- b) luminosity distance D_L vs. redshift z
- c) angular diameter distance D_A vs. redshift z
- d) comoving volume of a sphere V_C vs. redshift z
- e) lookback time vs. redshift z

In all plots make the redshift (x-axis) run from 0 to 3. In the three distance plots show the distances in units of h⁻¹Gpc. In the volume plot show the volume in h⁻³Gpc³. In the last plot show the lookback time in Gyr.

Hand in a printout of your code in addition to the four plots.