Hydrodynamics
Homework 9: Thermodynamics and waves
4. December 2025

Problem:
The intensity of sound is given by formula

$$I = \frac{(\Delta p)^2}{2\rho c},$$

where Δp is the pressure difference describing the sound amplitude, ρ is the density of the medium and c is the speed of sound. Further, the sound intensity level β in dB is defined by

$$\beta = 10 \log_{10} \frac{I}{I_0},$$

where $I_0 = 10^{-12}$ W m^{-2} is the reference intensity (lowest intensity that can be recognized by a standard ear). If a normal conversation on Earth has the sound intensity level 60 dB, compute how large would be the sound intensity level on Mars, if the pressure perturbation amplitudes are the same. The density of air on Earth is approximately 1 kg m^{-3}, on Mars 0.02 kg m^{-3}. You can use the speed of sound computed at the tutorials.