Oscillators, waves, fludis

1. The equation of harmonic oscillator is: $y = 8\sin\left(4\pi t + 0.25\pi\right)\ \left[\text{cm}\right]$. Find amplitude, period, frequency, phase and amplitude in t = 0 s.

2. Wind gusts create wave-ripples on the ocean that have a wavelength of 5 cm and propagate at 2 m/s. What is their frequency?

3. Provided that the amplitude is high enough, the human ears can detect sound in the range of frequencies from about 20 Hz to about 20 000 Hz. Compute the wavelengths corresponding to the frequencies
   (a) for waves in air (v = 343 m/s);
   (b) for waves in water (v = 1480 m/s).

4. In a pipeline with varying cross-section, there is a constant volume flow with 5 liters/second. What is the velocity of flow in cases, where the cross-section area is: a) $S_1 = 20\ \text{cm}^2$ and b) $S_2 = 100\ \text{cm}^2$?

5. In a wider part of a pipeline, water is flowing with a velocity 10 $\text{cm}\cdot\text{s}^{-1}$. What is the velocity of the water in a narrower part, which has a 2 times smaller radius?

HW: Mineral oil (density = 0.83 $\text{g}\cdot\text{cm}^{-3}$) is transported in a pipeline with a circular cross-section (r = 40 cm), with a velocity 1.5 $\text{m}\cdot\text{s}^{-1}$. Calculate the mass of the oil, transported in 1 hour.