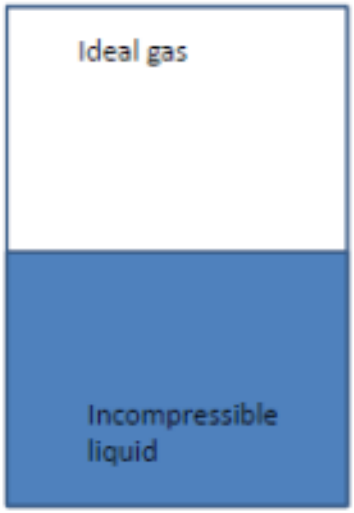
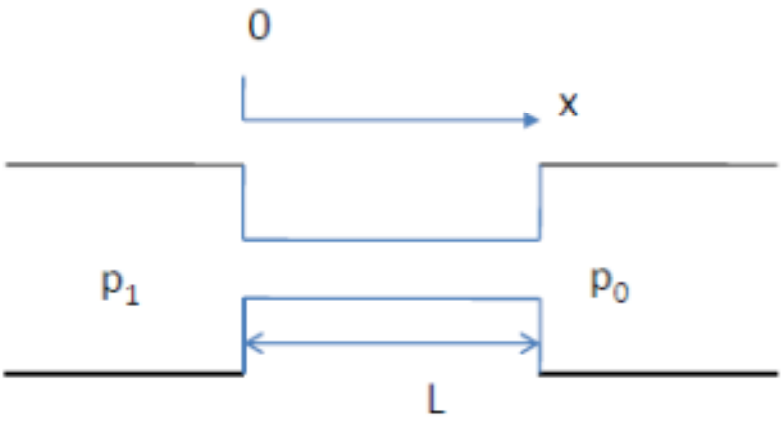
EX.1



A chamber is an adiabatic system and is filled with liquid and vapor of a single specie. Each phase takes
up 50% of the complete volume V. The chamber is heated with a constant heat flux.
a) What is the time-dependent change of pressure and temperature?
b) After which time the chamber is full of gas.

Definitions:
- All physical properties of the specie are known.
- Temperature and pressure are homogeneous.
- The incompressible liquid vaporizes to ideal gas
Do not forget the latent heat!
The saturation pressure psat(T) is known.

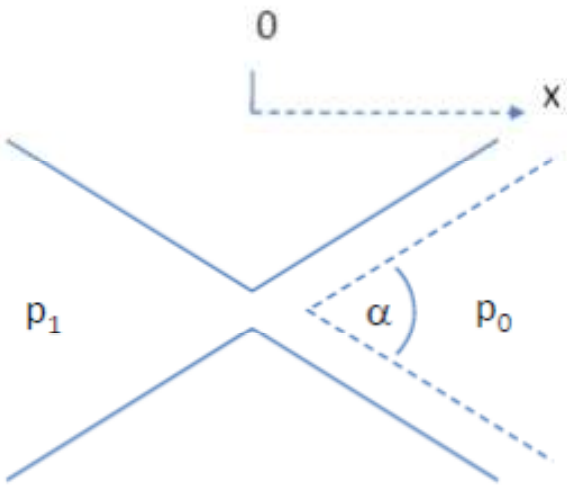
EX2



Two chambers are connected via a small channel. One chamber has pressure p1 and the other has the pressure far field p0<p1. Both chambers have the same temperature T0.

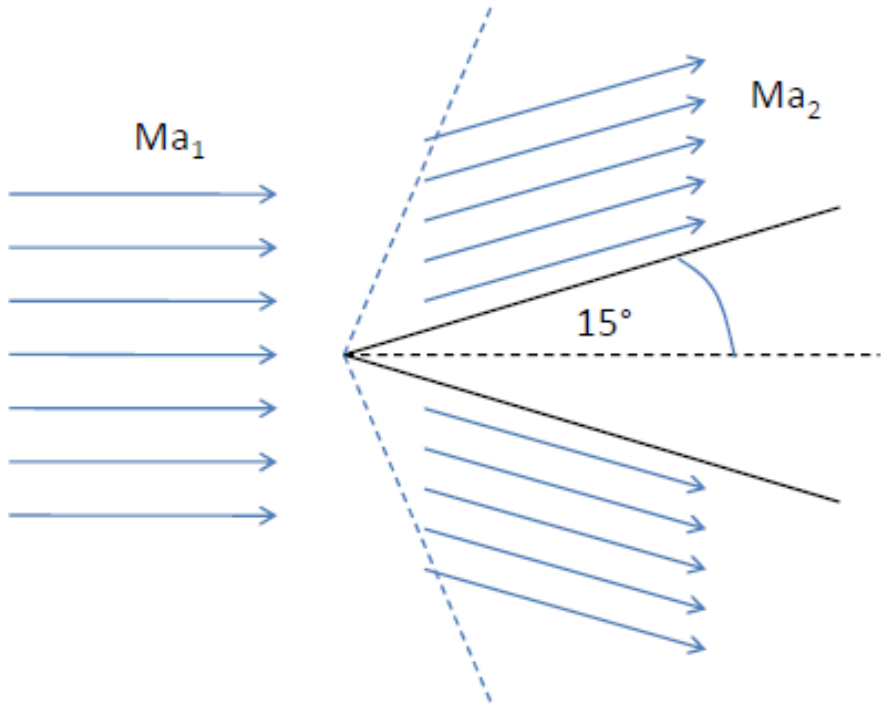
Describe the axial change of pressure p(x) and density ρ(x) in the channel. You may neglect the
change of entropy.
Definitions:
- The adiabatic coefficient g is constant.
- The medium is an ideal gas.

EX3



Two chambers are connected via a small gap. One chamber has pressure p1 and the other has the far field pressure p0<p1.
Describe the axial change of pressure p(x), temperature T(x) and density ρ(x) behind the gap.
You may neglect the change of entropy.
Definitions:
- The adiabatic coefficient g is constant.
- The expansion angle is a= 45°
- The medium is ideal gas.
p - The velocity in the gap is the speed of sound

EX4



This is a 2-D example of a supersonic flow. The stream lines beyond the shock are parallel to the wall.
a) What is the mach number Ma1, if a super-sonic flow near an edge is deflected by the shock wave with an angle of 15°?
b) What is the Mach number Ma2 behind the shock?