Going on a bike trip, someone sadly notices that a thorn has pierced into his tire. After removing the thorn, a little hole is left on the tire with a circular shape and a diameter $d = 0.5\ mm$. The unfortunate guy remembers that his tire was pumped to an overpressure $p = 3.5\ bar$ in the morning. The volume of the tire is roughly $V = 7\ l$. The temperature of the air inside the tire is $T = 30\ °C$. The ambient pressure is $p_0 = 1\ bar$, the ambient temperature is $T = 34\ °C$. The process between the inside of the tire and the hole can be looked at as isentropic.

DATA: $c_p = 1004\ J/kg/K$, $\kappa = 1.4$

ASSIGNMENTS:
a., Determine the mass flow rate of the outflow through the hole!
b., Draw a diagram of how the mass flow rate changes with respect to time! The diagram should show the mass flow rate change qualitatively well.
c., Assuming the determined initial mass flow rate is constant, determine when the tire will be completely flat!