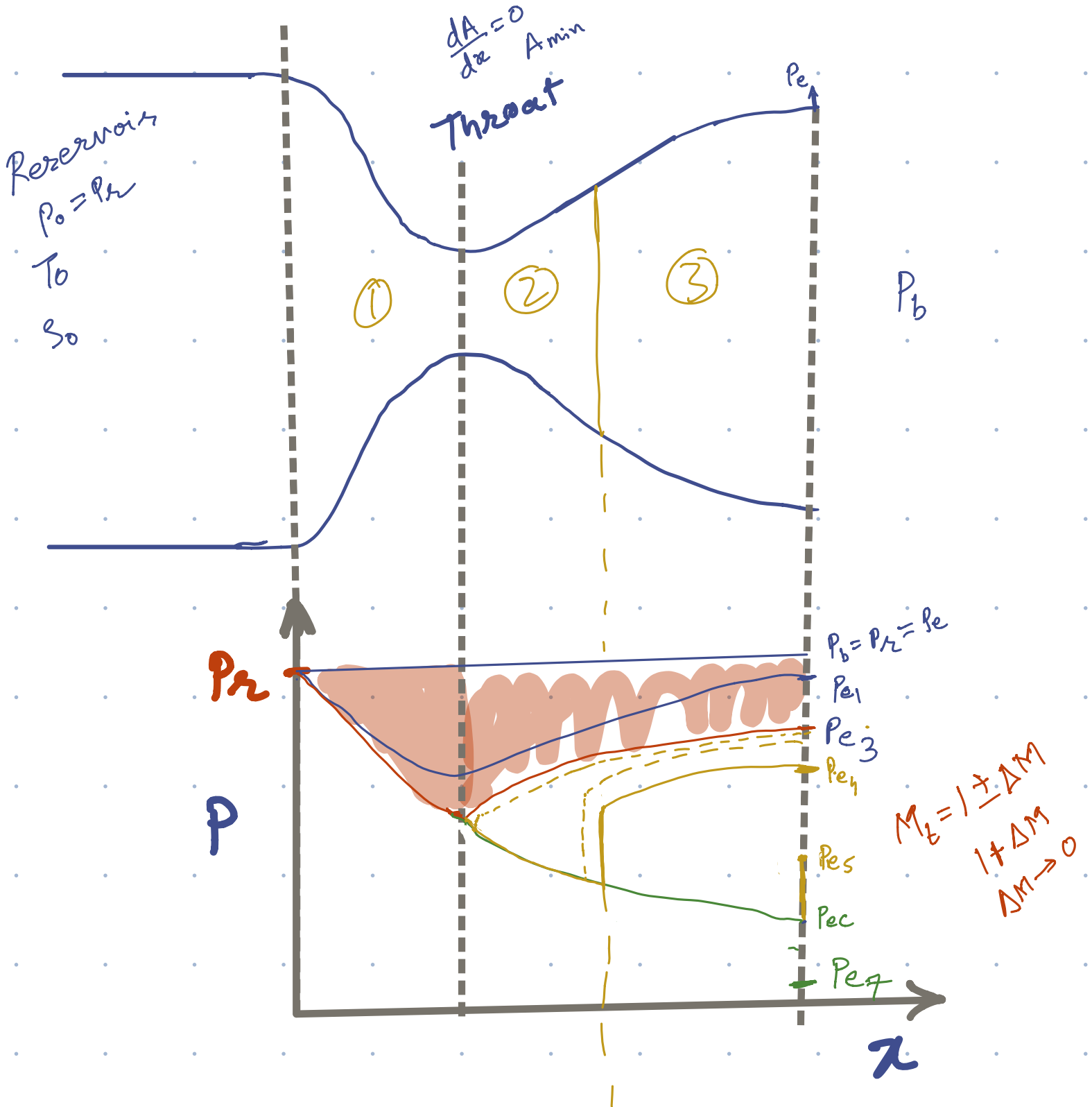
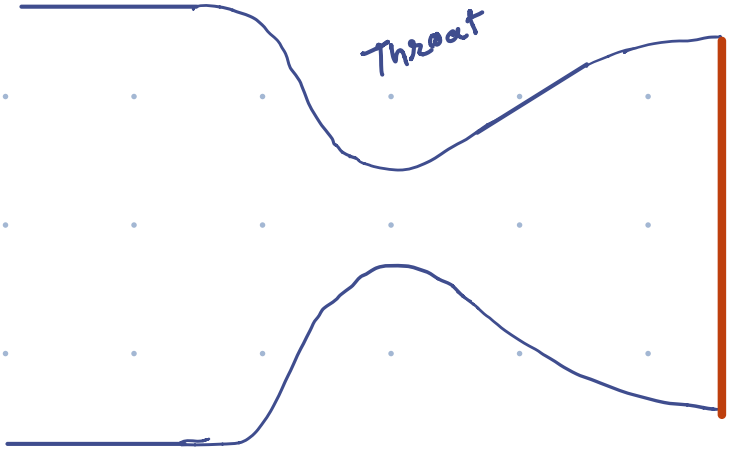
Isentropic flow in a C-D nozzle

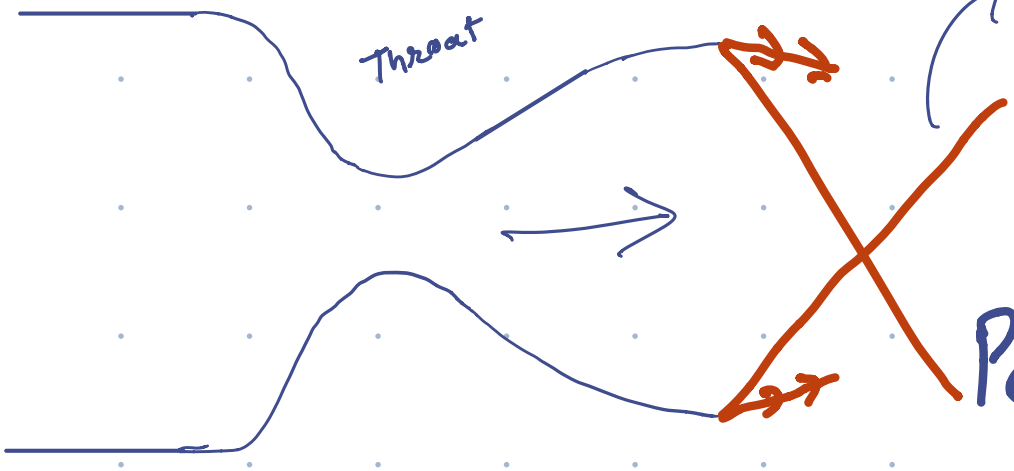
→ De Laval nozzle

→ Converging-Diverging nozzle.





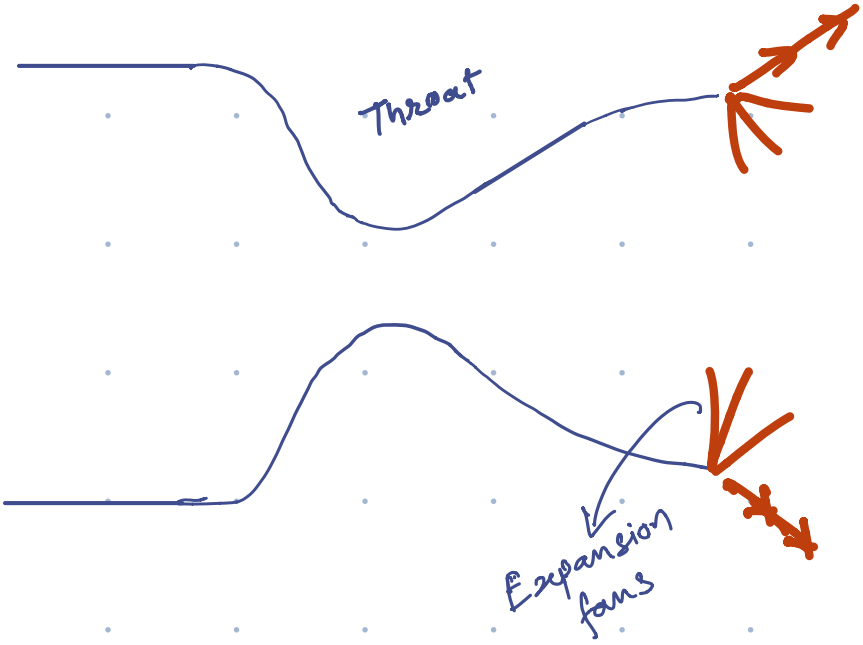
$P_b = P_{e_5}$



oblique shocks

Over expanded flow

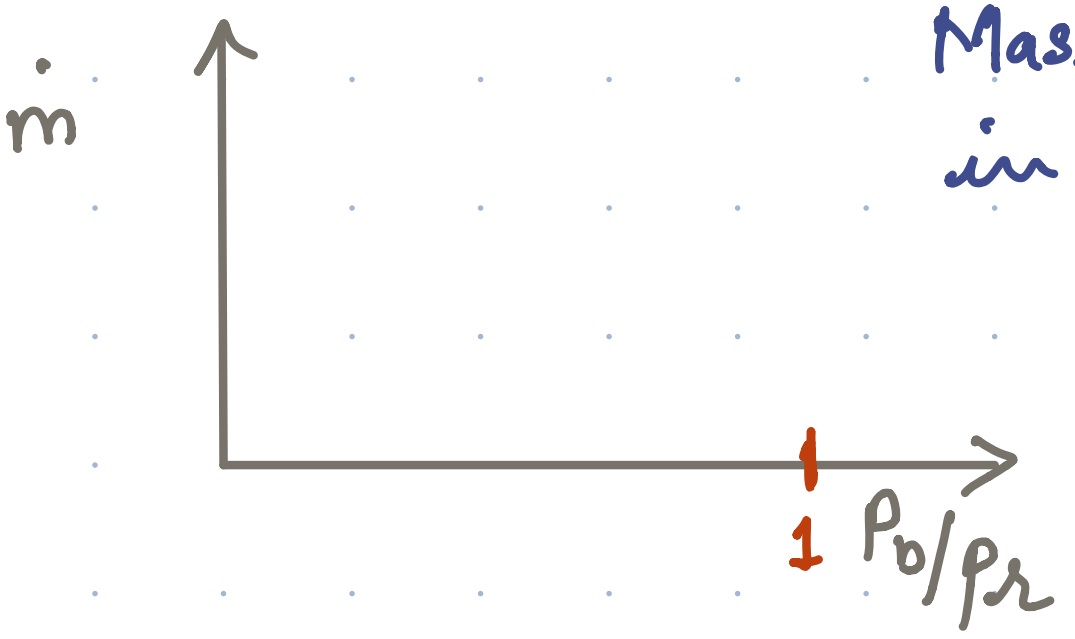
$P_{e_5} \geq P_b > P_{e_c}$



Under expanded flow.

$P_b < P_{e_c}$

Mass flow rate in CD nozzle



Q: Is the above graph valid for the cases where shocks are present?