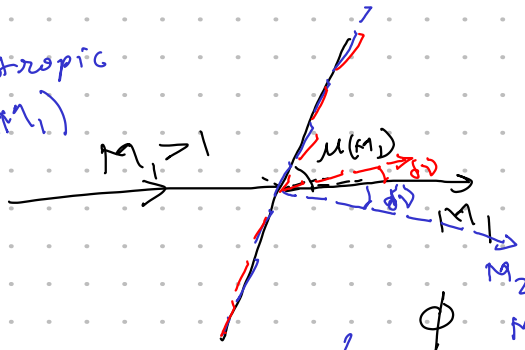
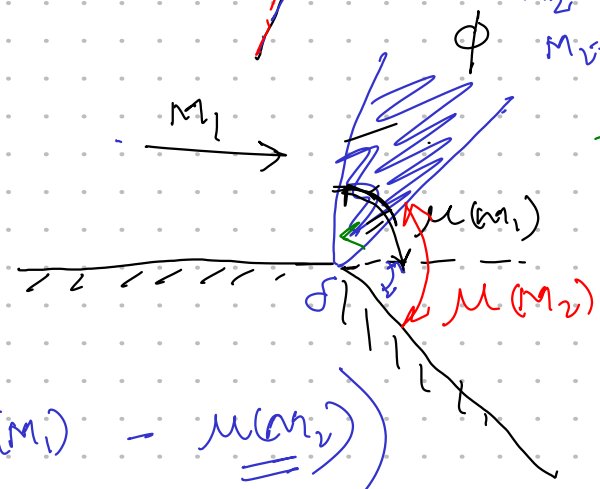
# Prandtl – Meyer Flow

→ Isentropic

→ $\mu(M_1)$




$$\int_{\nu_1}^{\nu_2} d\nu = \int_{M_1}^{M_2} \frac{\sqrt{M^2-1}}{1+\frac{\gamma-1}{2}M^2} \cdot \frac{dM}{M}$$




$T_{0_1} = T_{0_2}$

$p_{0_1} = p_{0_2}$

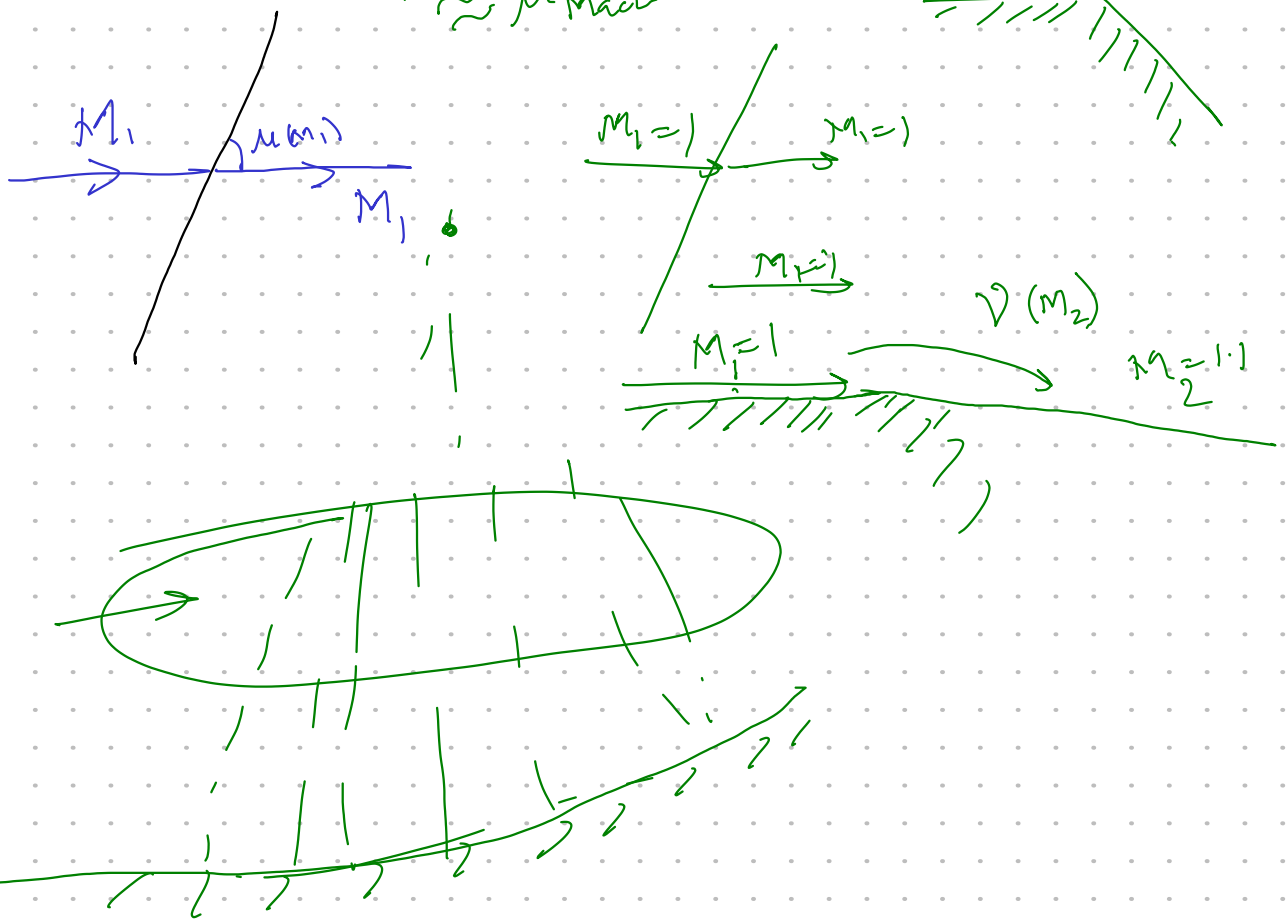
$M$ $\quad \Delta\nu = \nu(M) - \nu(1)$

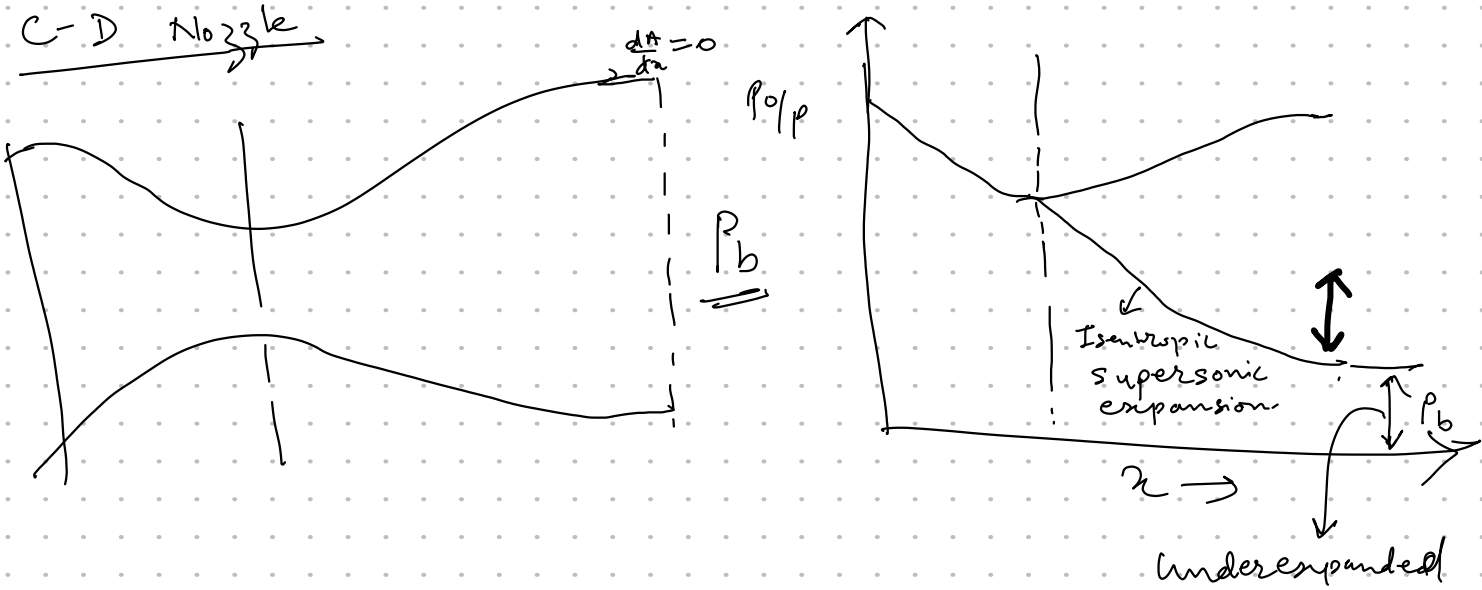

$$\delta = \nu_2 - \nu_1 = \nu_2 - \nu_{ref} - (\nu_1 - \nu_{ref})$$

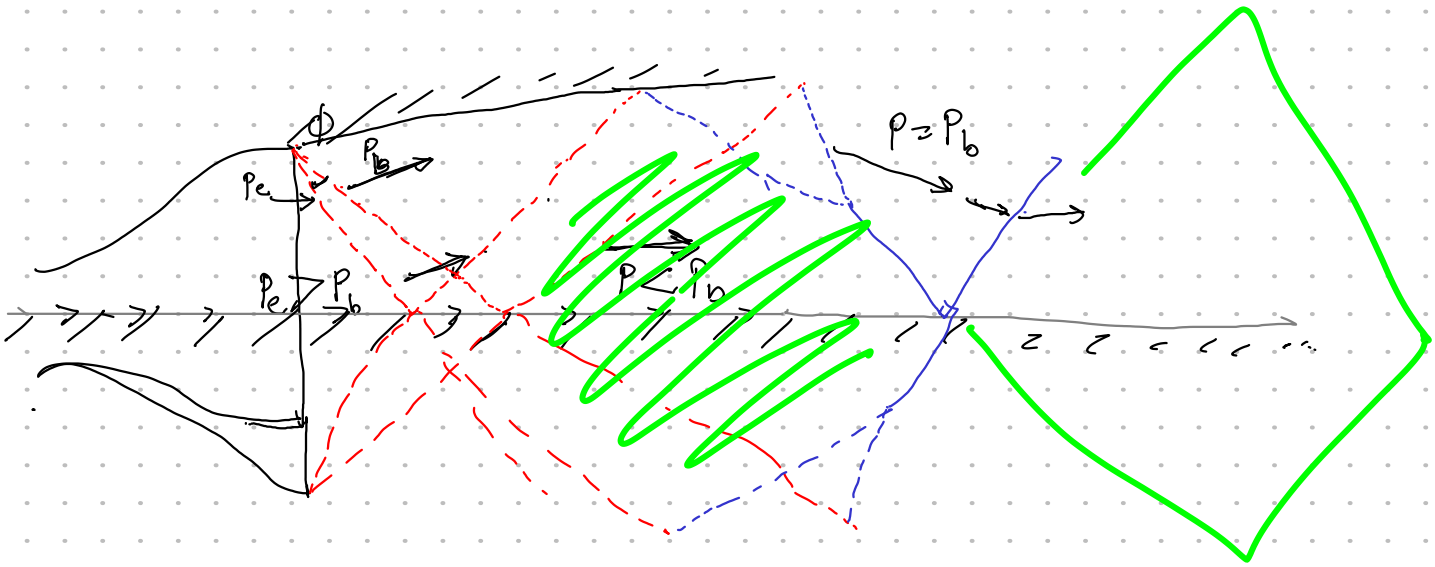
$$\phi = \left(\mu(M_1) - \mu(M_2)\right) + \delta$$

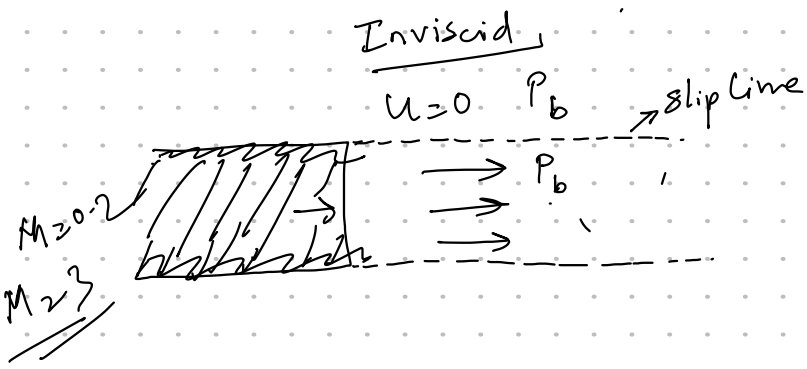
$\beta_{emp} = \mu_{opt} + \delta\mu$

$\simeq M_{Mach}$




C-D Nozzle
$\frac{dA}{dx} = 0$
$P_0/P$
$P_b$
Isentropic supersonic expansion
$P_b$
x →
Underexpanded


$P_b$
$P_e$
$P_e$
$P_b$
$P < P_b$
$P = P_b$


Inviscid
$u = 0$
$P_b$
slip line
$P_b$
$M = 0.2$
$M > 3$