$\Rightarrow$

$$\boxed{\frac{F}{\dot{m}} = a_0\left\{\left[\frac{2\tau_{\lambda AB}}{\gamma-1}\left(1-\frac{4\tau_\lambda}{(\tau_\lambda+\tau_r)^2}\right)\right]^{1/2}-M_0\right\}}$$

QED

for the plots for parts (a) + (b) need

$$a_0 = \sqrt{\gamma R T_0} = \sqrt{(\gamma-1)C_p T_0} = 297.39 \text{ m/s}$$

with $\gamma = 1.4$ $C_p = 1005$ J/kg K $T_0 = 220$K

$$\tau_r = 1 + \frac{\gamma-1}{2}M_0^2 = 2.25$$

with $\gamma = 1.4$ $M_0 = 2.5$

$$f = \frac{C_p T_0}{h}\left(\tau_{\lambda AB} - \tau_r\right)$$

$$S = \frac{f}{F/\dot{m}}$$

with $F/\dot{m}$ and τ_r given above. C_p and T_0 given above, $h = 4.42\times10^7$ J/kg

Plot using given ranges of τ_λ and $\tau_{\lambda AB}$