Exercice 1 :

1)Le nombre de Mach après l'onde de choc droit :

$$Ma_2 = \frac{(\gamma-1)Ma_1^2+2}{2\gamma.Ma_1^2-(\gamma-1)} = 0.5775$$

2) Calculer les rapports $\frac{P_2}{P_1}$. $\frac{T_2}{T_1},\frac{U_2}{U_1}$, $\frac{P_{02}}{P_{01}}$.

$$\frac{P_2}{P_1} = \frac{2\gamma.Ma_1^2}{(\gamma+1)} = \frac{(\gamma-1)}{(\gamma+1)} = 4.5$$

$$\frac{T_2}{T_1} = \left[\frac{2\gamma.Ma_1^2}{(\gamma+1)}-\frac{(\gamma-1)}{(\gamma+1)}\right]\left[\frac{(\gamma-1)}{(\gamma+1)}+\frac{2}{(\gamma+1).Ma_1^2}\right] = 1.6875$$

$$\frac{U_1}{U_2} = \frac{(\gamma+1).Ma_1^2}{2+(\gamma-1).Ma_1^2} = 2.67$$

$$\frac{P_{02}}{P_{01}} = \frac{P_{02}}{P_2}.\frac{P_2}{P_1}.\frac{P_1}{P_{01}} = 0.7209$$

Exercice 2:

1)

a) La pression de stagnation (P_{02} **) :**

$$\frac{P_{02}}{P_{01}}=0.7209 \Rightarrow P_{02}=P_{01}.0.7209=0.7209\,MPa$$

b) La pression statique ($P_2¿$ **:**

$$\frac{P_2}{P_1}=4.5 \Rightarrow P_2=P_1.4.5=0.575\,MPa$$

c) La temperature (T_2 **) :**

$$\frac{T_2}{T_1}=1.6875 \Rightarrow T_2=T_1.1.6667=750\,K$$

d) La densité (ρ_2 **) :**

$$\frac{\rho_2}{\rho_1} = 2.6667 \Rightarrow \quad \rho_2=\rho_1.2.6667 \quad = 2.67\ \text{kg/m}^3$$

2) la variation d'entropie :

$$2)\ \Delta S = \quad S_2-S_1 \quad = \text{Cp.log}\left(\frac{T_2}{T_1}\right) - \text{r.log}\left(\frac{P_2}{P_1}\right)$$

$\Delta S = 0.0942$ KJ/Kg.K

3) la vitesse à la sortie.

3) $Ma_2 = \frac{U_2}{\sqrt{\gamma r T_2}} \Rightarrow U_2 = \sqrt{\gamma r T_2}$ .0.5774 = 317m/s