Problem 3.2

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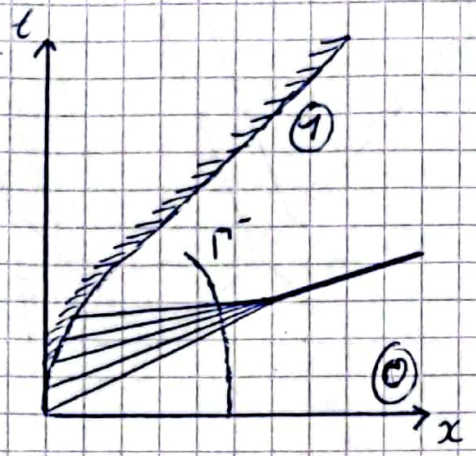
a.



J^-: $u_0 - \frac{2}{\gamma-1} a_0 = u_1 - \frac{2}{\gamma-1} a_1$

$u_0 = 0$ and $u_1 = 3a_0$

$-\frac{2}{\gamma-1} a_0 = 3a_0 - \frac{2}{\gamma-1} a_1$

$\rightarrow \quad \frac{a_1}{a_0} = \left(3 + \frac{2}{\gamma-1}\right)\frac{\gamma-1}{2}$

$\frac{p_1}{p_0} = \left(\frac{a_1}{a_0}\right)^{\frac{2}{\gamma-1}}$ where $\gamma = \frac{5}{3}$ (IIc)

$$\boxed{\frac{p_1}{p_0} = 8}$$

b. The flow will no longer be homentropic, so the density ratio would be lower.

According to strong shock limit:

$$\frac{\rho_2}{\rho_1} = \frac{\gamma+1}{\gamma-1} = 4$$