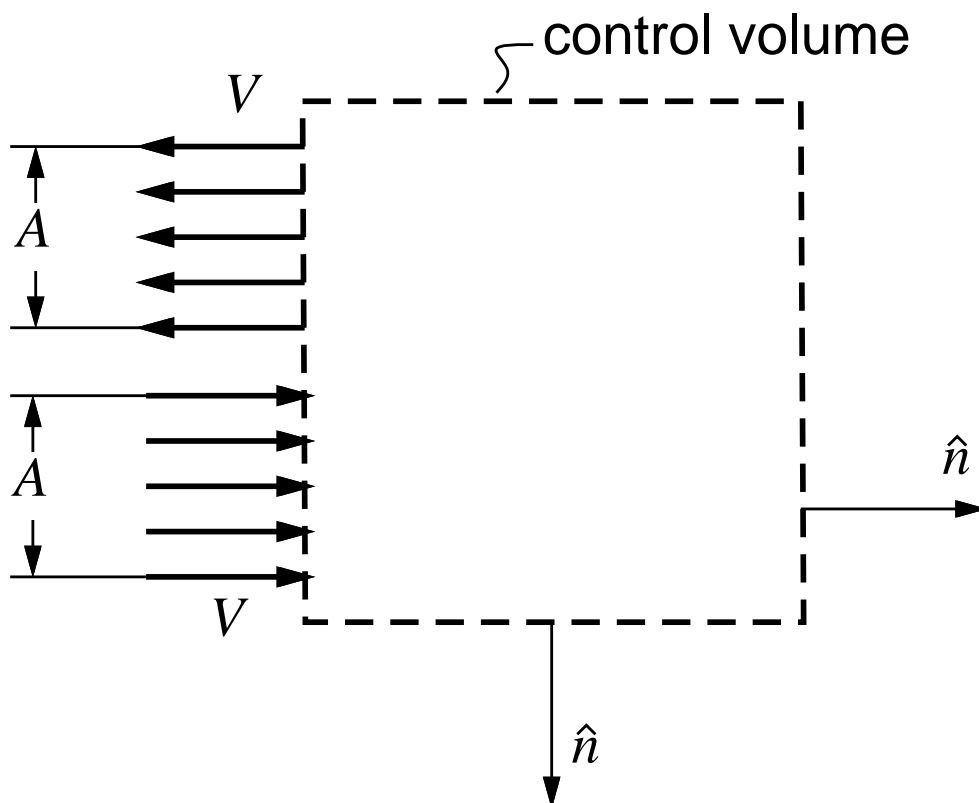


Two fluid jets of the same density ρ and internal energy e flow as shown. What is the internal energy flow integral for the control volume?

$$\iint \rho (\vec{V} \cdot \hat{n}) e \, dA$$

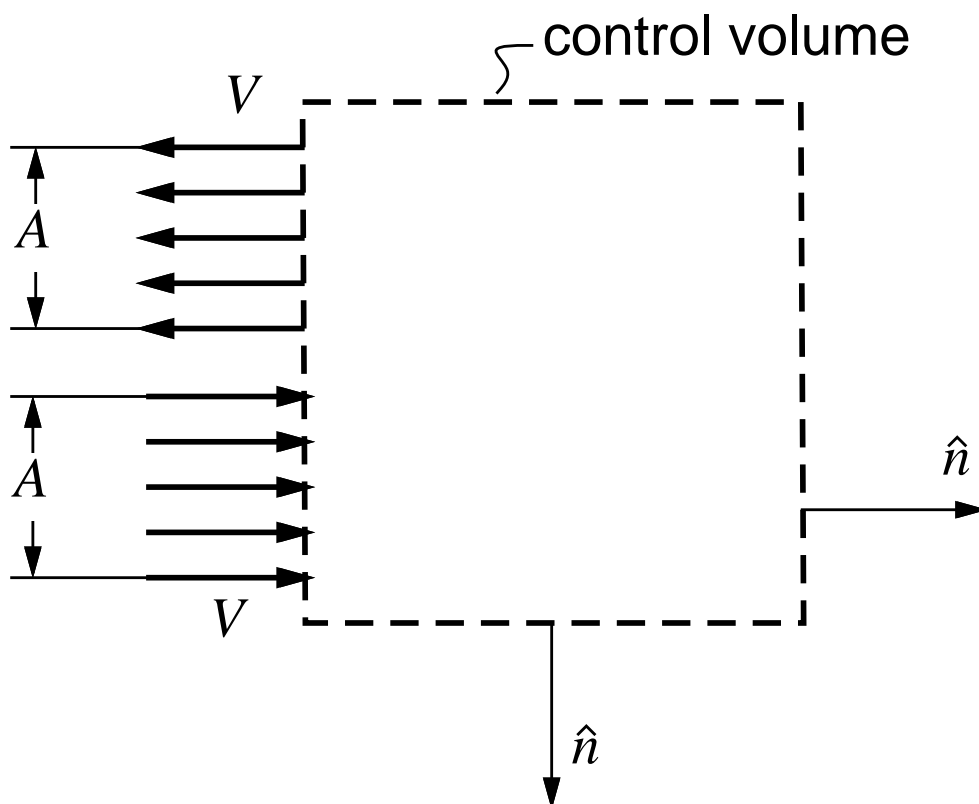
1. $2\rho VA e$
2. $-2\rho VA e$
3. $* 0$
4. not sure



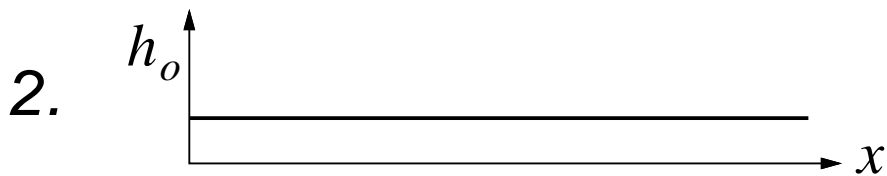
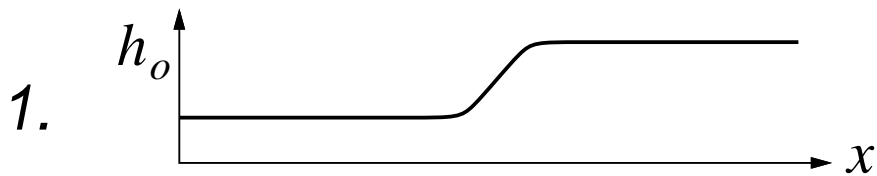
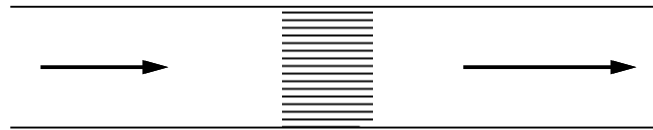
Two fluid jets of the same density ρ flow as shown. What is the kinetic energy flow integral for the control volume?

$$\iint \rho (\vec{V} \cdot \hat{n}) \frac{1}{2} V^2 dA$$

1. $\rho V^3 A$
2. $-\rho V^3 A$
3. * 0
4. not sure



Air is forced through a porous plug.
What's the expected $h_o(x)$ distribution?



4. Not sure

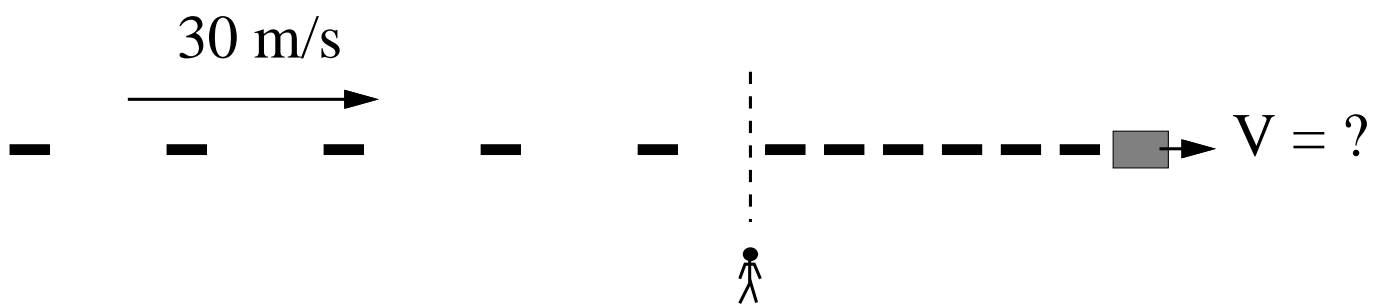
2. *

Air flows out of a nozzle from a pressurized tank at room temperature. The air comes out cold. What is the jet's density relative to ambient?

1. * Higher
2. Same
3. Lower
4. not sure

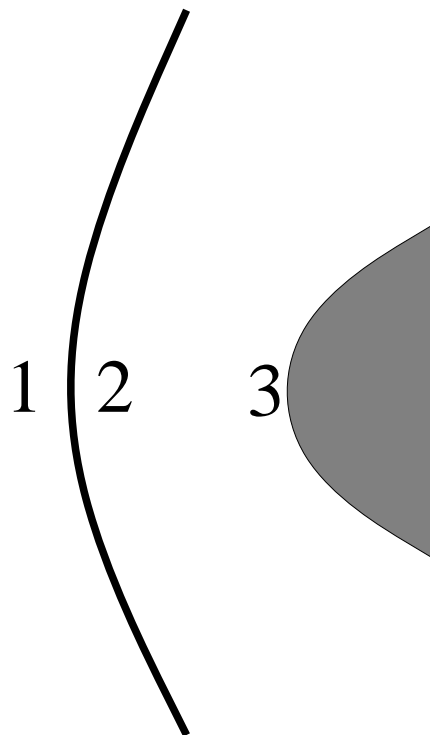
The spacing of the cars is 40m and 4m before and after the “shock”. The shock appears stationary to a stopped pedestrian. How fast is the obstructing vehicle moving?

1. 3.3 m/s
2. * 3.0 m/s
3. 2.7 m/s
4. not sure

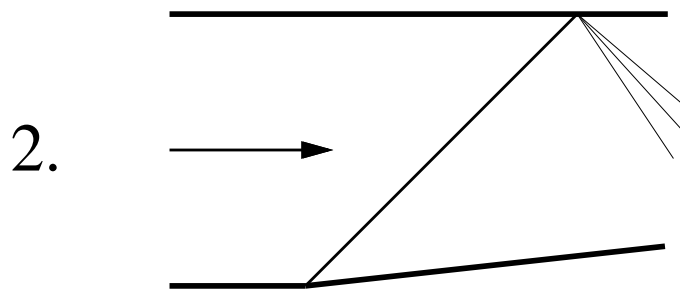
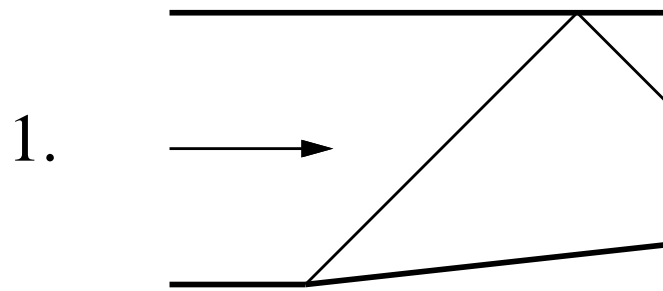


What is true about the temperatures T_1 , T_2 , T_3 , (or enthalpies h_1 , h_2 , h_3) at the points shown?

1. $T_1 > T_2 > T_3$
2. * $T_1 < T_2 < T_3$
3. $T_1 < T_2 = T_3$
4. Not enough information given
5. Not sure



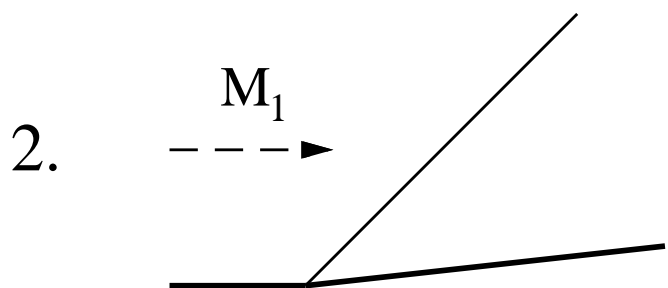
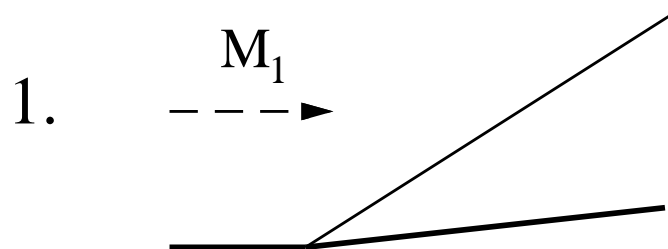
Which flow pattern is physically correct?



3. Not sure

1. *

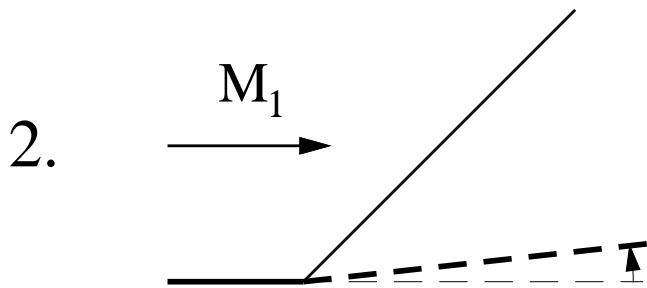
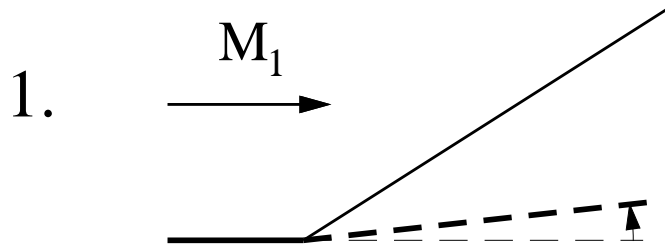
The two flows have the same wall shape.
Which flow has a larger M_1 ?



3. Not sure

1. *

The two flows have the same M_1 . Which flow has a larger turning angle?

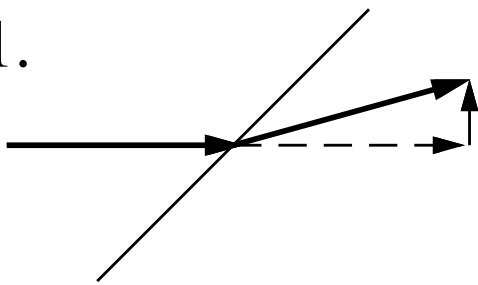


3. Not sure

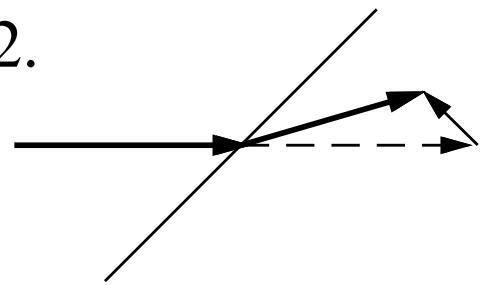
2. *

Which is a physically-possible shock flow?

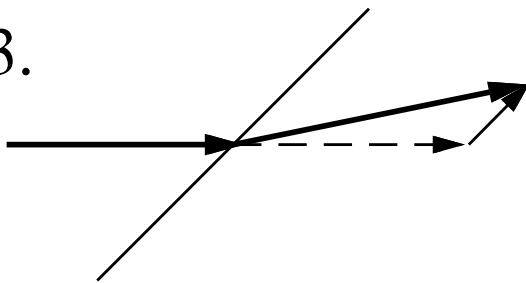
1.



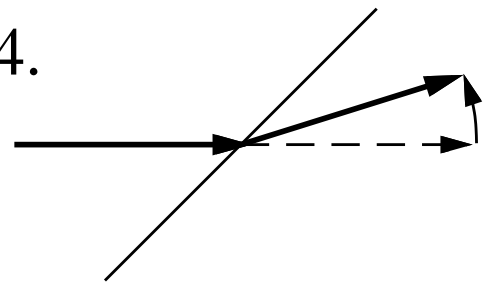
2.



3.



4.



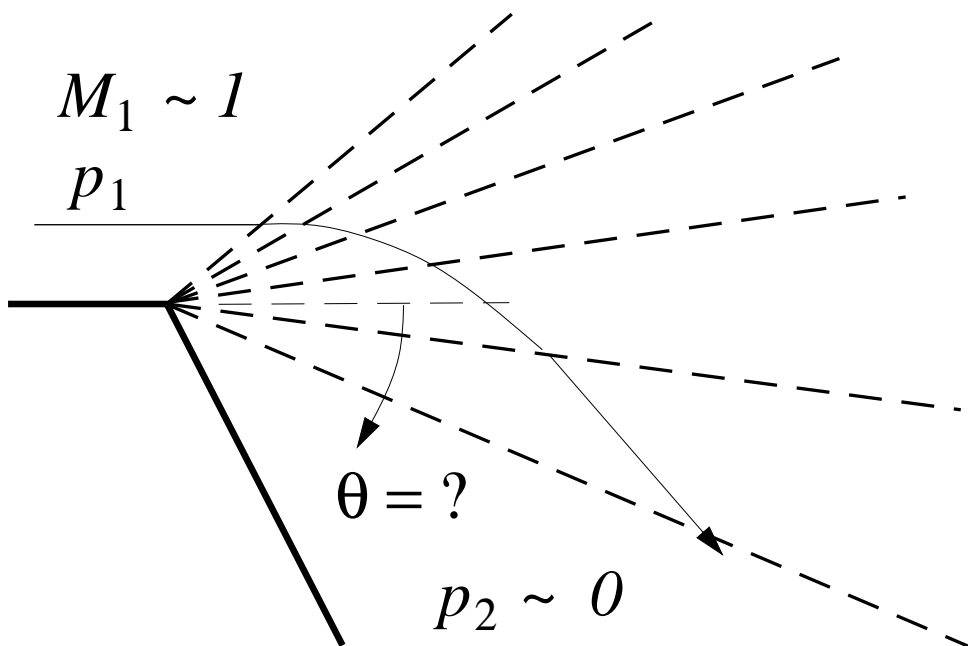
5. All are valid

6. Not sure

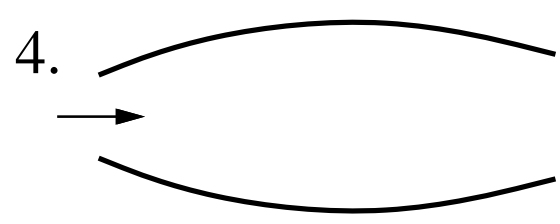
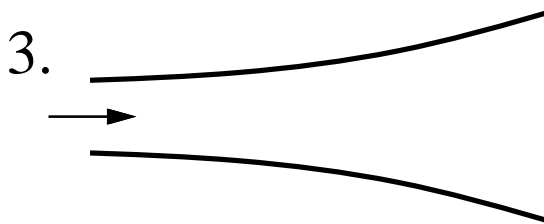
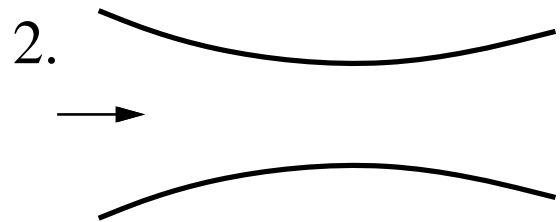
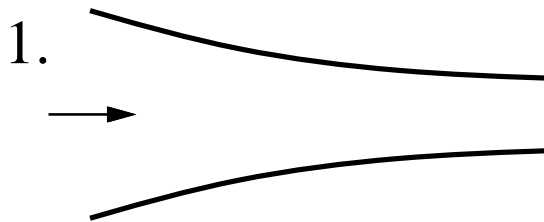
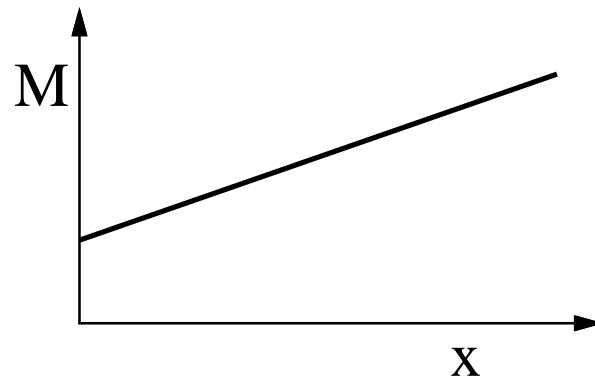
2. *

A fan expands from $M_1 \simeq 1$ to near vacuum. Approximately, what is the expected turning angle?

1. $\theta = 45^\circ$
2. $\theta = 90^\circ$
3. * $\theta = 130^\circ$
4. not sure



A flow in a duct accelerates smoothly from $M = 0.5$ to $M = 1.5$. What must the duct look like?



5. Not sure

2. *

Low-speed flow is drawn from a reservoir by the exit pressure p_e .

$$p_r = 100000 \text{ Pa}$$

$$\rho_r = 1 \text{ kg/m}^3$$

$$A = 1 \text{ m}^2$$

$$A_{\text{throat}} = 0.5 \text{ m}^2$$

If $p_e = 99000 \text{ Pa}$, what is \dot{m} ?

1. 100 kg/s
2. * 45 kg/s
3. 22.5 kg/s
4. not sure

