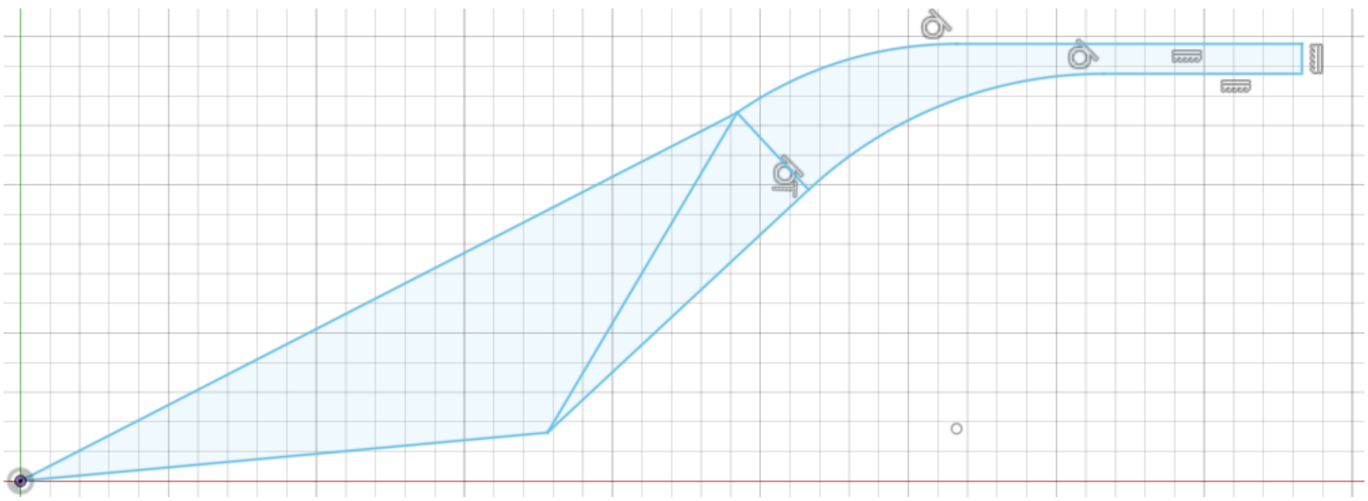
DynGas Work 1

I have some questions about the geometry of Work 1 - Part 1.

As I understood it, our geometry is in the picture below, has the following geometrical constraints:

- θ_1 and θ_2 are positive
- D is arbitrary, and scales the geometry. Can be taken as unitary for analysis purposes
- The lengths of the walls defined by θ_1 and θ_2 are constrained by the angles θ_1, θ_2, β_1, β_2 (because of the meeting point, constrained by the normal shockwave)
- At the normal shockwave, the wall defined by θ_2 meets a tangent arc.
- This tangent arc ends in a tangent horizontal line, at a y distance D_int
- At the point where the shockwaves meet, an arc starts that ends in a tangent horizontal line, at a y distance D.



Further, the geometry is constrained by the minimization problem:

- Flow_∞ is given
- θ_1 and θ_2 are the solution to the minimization problem (geometry with smallest Total Pressure drop for given conditions)
- β_1 and β_2 are functions of θ_1, θ_2, and the initial conditions
- D is arbitrary, and scales the geometry. Can be taken as unitary for analysis purposes
- D_{int} is determined so that the normal shockwave happens in the correct location?
    - I'm not sure how to determine this
    - I'm not sure what causes the shockwave to occur there
    - Maybe it is solvable with Mach-Area relationship, like in part 2, but I can't see how to apply it here
    - Is it supposed to have reducing area? (If so, wouldn't the Mach-Area relationship state that the normal shockwave should happen at the smallest area)
    - Is it supposed to have increasing area? (If so, what causes the shockwave?)
- Even if you can constrain D_{int}, the geometry is under-constrained. For example, here are 2 different geometries with $D_{\text{int}} = 0.8D$ with the same angles:

- Constant area after the normal shockwave does constrain the geometry, but I don't think there is a mechanism for the normal shockwave without change of area in this region