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Professor de Rosa  
E 234  
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I pledge my honor that I have abided by the Stevens Honor System.  
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Homework 5

1. Mass flow, inlet area


5. 1. Pressure increases.
   2. A compressor requires work input.
   3. Temperature goes up.  
      Because Win, mass flow, and cp is positive, Δh must be positive, which means ΔT must be positive, which means temperature increased.
   4. Mass flow rate is constant. The amount of mass flowing into the compressor is the same as the mass flowing out due to conservation of mass.
   5. Mass flow rate is volume flow rate times density.
   6. Because according to the ideal gas law (PV=mRT), density is a function of P/RT, where R is a constant, (P/T)out > (P/T)­in implies that density at the outlet is higher than density at the inlet.
   7. Because mass flow is equal, and mass flow is volume flow rate times density, the density being higher at the outlet implies that the volume flow rate is lower at the outlet.
   8. Mass flow rate is constant in a steady flow device, as the net change in mass within the control volume is 0.
   9. Volume flow rate is not always constant in a steady flow device, as shown in part g.
   10. It is only constant if density does not change, as steady flow device implies that mass flow rate is constant.