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**HOMEWORK PROBLEMS: Lesson 1**

Adapted from Cengel, Turner, & Cimbala, *Fundamentals of Thermal-Fluid Science*, 3<sup>rd</sup> Ed.

- 1-1 Air enters an adiabatic nozzle steadily at 300 kPa, 200°C, and 30 m/s and leaves at 100 kPa and 180 m/s. The inlet area of the nozzle is 80 cm<sup>2</sup>. Find (a) the mass flow rate through the nozzle, (b) the exit temperature of the air, and (c) the exit area of the nozzle. Assume  $c_{p, air} = 1.02$  kJ/kg-K throughout. (0.530 kg/s, 184.6°C, 38.7 cm<sup>2</sup>)
- 1-2 An adiabatic compressor compresses 10 L/s of air at 120 kPa and 20°C to 1000 kPa and 300°C. Find (a) the work per unit mass (kJ/kg) and (b) the power (kW) required by the compressor. Assume  $c_{p, air} = 1.017$  kJ/kg-K throughout. (285 kJ/kg, 4.06 kW)