(1) Pratt and Whitney also donated a compressor to your department, also claimed to be an isentropic compressor.

So you decided to build a jet engine with this compressor (run by electricity). You found a straight pipe (cross-section=A) in the Lab, and the P&W compressor fits nicely in it. So you build a good look inlet section (with a flair, smooth, rounded lip). The jet comes out of the pipe as a straight jet. The jet engine is to sit at rest on a test stand in the large Lab room. Assume perfect gas, etc.

For a given energy input, $\dot{W}$ (energy per unit time. Will use the sign convention that it is positive when the compressor is operating as a compressor), find:

(a) The mass flow rate through the jet engine.

(b) The thrust measured by an instrument on the test stand of this jet engine.

(c) The compressor is mounted inside the pipe. Obviously, if the mounting screws were missing, the compressor will move forward. Find the force exerted by the compressor on the pipe.

(d) You will find that the answer from (a) and (d) are not the same. Think of a reasonable explanation for this observation.

(e) You have done all the analysis symbolically. How does your answers depend on $A$? Could the $A$ dependence of the answer be deduced beforehand?

(f) How does "choking" at the jet engine exit enters into your considerations?

(g) If you remove the diffusor of your subsonic wind tunnel, you find that you already have a jet engine! Find the exit Mach number of this jet engine at maximum power. Then find the thrust.