

**Due date:** Tuesday, Feb. 24

**Deadline:** Thursday, Feb. 26

B means a problem in Blundell & Blundell's text; GT means a problem in Gould & Tobochnik.

1. B 13.4

2.. B 13.5 (Otto cycle)

3short B 13.6 is also very interesting, but involves many steps to solve. You should be aware of the starting equations, so answer the following:

- a) Write the relation between  $Q$  and  $Q_2$  implied by steady state.
- b) Write the relation between  $E$ ,  $Q_1$ , and  $Q_2$  determined by the 1<sup>st</sup> law.
- c) Write the relation between  $Q_1$ ,  $Q_2$ ,  $T_1$ , and  $T_2$  following from the air conditioner operating on a Carnot cycle.

The rest is algebra, which is NOT assigned. DON'T HAND IN THE REST OF THE PROBLEM!!

4. B 13.7

5. Consider a rectangular cyclic path ABCDA in the  $pV$  diagram of an ideal gas. Let A be  $(V_1, p_2)$ , B be  $(V_2, p_2)$ , C be  $(V_2, p_1)$ , D be  $(V_1, p_1)$ . Assume  $p_2 > p_1$  and  $V_2 > V_1$ . The graph resembles Fig. 13.2, but with the vertical axis labeled  $p$  and the horizontal axis  $V$ ,  $T_h \rightarrow p_2$ ,  $T_\ell \rightarrow p_1$ , and no adiabat or isotherm labels or  $Q$ 's. How much work is done *on* the gas during this cyclic process?