Try to simulate circuits using SPICE (if possible) and compare the results with your answers. The extra problems are stared (*) and need not to be handed in. Assume all capacitances are big enough.

1. For the circuits shown below, a) Find the bias points; b) Find $R_{in}, R_{out}, A_v$. If not mentioned, assume that:
   
   $\beta = 200, \left|V_{BE(on)}\right| = 0.7^\circ, \left|V_{CE(sat)}\right| = 0.2^\circ, V_A = 100^\circ$

   (a) $\Rightarrow$

   (b) Two cases: considering/neglecting $C_2$

   (c) $I = 20mA$
2. For the circuit shown below ($\beta = 100, |V_{BE(on)}| = 0.7V, |V_{CE(sat)}| = 0.2V, V_A = 50V$), determine: transistor bias current/voltages; Differential/common mode voltage gains; Differential/common mode input resistances; Output resistance; Common mode rejection ratio; Output voltage swing.

3. For the circuit shown below ($\beta = 200, |V_{BE(on)}| = 0.7V, |V_{CE(sat)}| = 0.2V, V_A = 50V$):
   a) Find transistor bias points.
   b) Find $A_{vdd}, A_{vcc}, R_{ind}, R_{inc}$
   c) if 2 transistors are not matched ($I_{s1} = 0.1P^A, I_{s2} = 0.15P^A$), find bias points; Find new value for $R_{E2}$ such that $I_{c1} = I_{c2}$.
   d) if $R_{C1} = 0$, and 2 transistors are matched find bias points; Find new value for $R_{E2}$ such that $I_{c1} = I_{c2}$.
   e) repeat b) for the conditions in c)