1. Assume the transistors at the right have a finite $\beta$ and an infinite Early voltage. Write an expression for the input resistance $R_{in}$ in the circuit shown below. Your expression should include only real resistances ($R_1$, $R_2$, $R_3$, $R_4$, or a subset of these) and possibly $\beta$, $r_e$ or $r_{π1}$, and $r_e$ or $r_{π2}$. (Assume all transistors have the same $\beta$.) Circle your answer.

2. The transistors below are identical, use $V_{BE}=0.7$, $\beta=100$, $g_m=80\text{m A/V}$, $r_e=1250\Omega$, $C_1=C_2=100\mu\text{F}$.
   (a) Find the complete frequency response for $V_o/V_{\text{sig}}$, ignore $r_o$ and the parasitic capacitors.
   (b) Find the low frequency pole values.

3. Use the following circuit for both problems #3 and #4: $\beta=100$, $|V_{BE}|=0.7$ Find $V_{E1}$, $V_{C1}$, $V_{C2}$, $V_{E2}$, $V_{E3}$, $V_{C3}$, $I_{E1}$, $I_{E2}$, and $I_{E3}$.

4. Analyze the circuit to find the midband gain $V_o/V_{\text{sig}}$, $R_{in}$ (ignore input source, $V_{\text{sig}}$), and $R_{out}$ (ignore $RL=1k$).
5. The input and output curves vs time are shown below. Explain in detail why this circuit is not amplifying the signal and is instead 0V. \( V_{CE_{SAT}} = 0.2 \text{V}, \ V_{BE} = 0.7 \text{V}, \ \text{and} \ \beta = 100. \)

6. \( \beta \) can range from 40 to 200. For the two extreme values of \( \beta (\beta = 40 \ \text{and} \ \beta = 200) \) find \( I_E, \ V_E, \ V_B, \ \text{Rin} (\text{ignore the source resistance} \ 10k), \ \) and the midband voltage gain \( \frac{V_{out}}{V_{sig}}. \)