Problem 1

For the common-emitter amplifier shown in Fig. P5.130, let $V_{CC} = 9 \text{ V}$, $R_1 = 27 \text{ k}\Omega$, $R_2 = 15 \text{ k}\Omega$, $R_E = 1.2 \text{ k}\Omega$, and $R_C = 2.2 \text{ k}\Omega$. The transistor has $\beta = 100$ and $V_A = 100 \text{ V}$.

Calculate the dc bias current $I_E$. If the amplifier operates between a source for which $R_{\text{sig}} = 10 \text{ k}\Omega$ and a load of 2 kΩ, replace the transistor with its hybrid-$\pi$ model, and find the values of $R_{\text{in}}$, the voltage gain $v_o/v_{\text{sig}}$, and the current gain $i_o/i_i$. 

![Figure P5.130](image-url)
Problem 2

5.136 In the circuit of Fig. P5.136, $v_{\text{sig}}$ is a small sine-wave signal. Find $R_{\text{in}}$ and the gain $v_o/v_{\text{sig}}$. Assume $\beta = 100$. If the amplitude of the signal $v_{be}$ is to be limited to 5 mV, what is the largest signal at the input? What is the corresponding signal at the output?