Problem 3.76  The circuit in Fig. P3.76 is a BJT common emitter amplifier. Find $V_{out}$ as a function of $V_{in}$.

![Figure P3.76: Circuit for Problem 3.76.](image)

Solution: Upon replacing the BJT with its equivalent circuit model, we obtain the circuit in Fig. 3.76(b).

![Fig. P3.76(b)](image)

\[ V_{out} = \beta I_B R_L, \]
\[ I_B = \frac{V_{in} - V_{BE}}{R_s}. \]

Hence,
\[ V_{out} = \beta \left( \frac{R_L}{R_s} \right) (V_{in} - V_{BE}) \simeq \left( \beta \frac{R_L}{R_s} \right) V_{in} \quad \text{(if } V_{in} \gg V_{BE}). \]