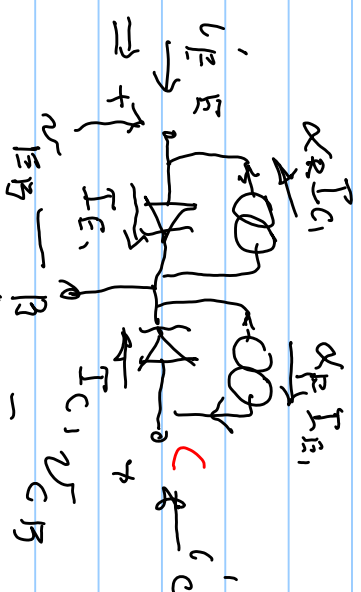
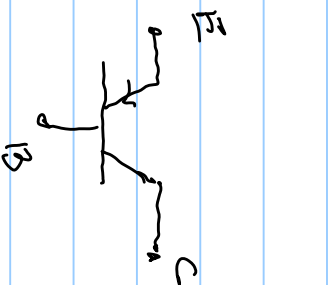
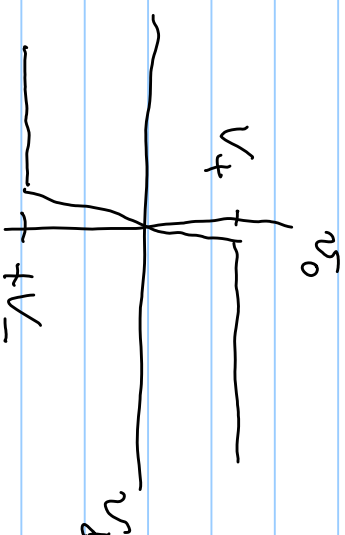
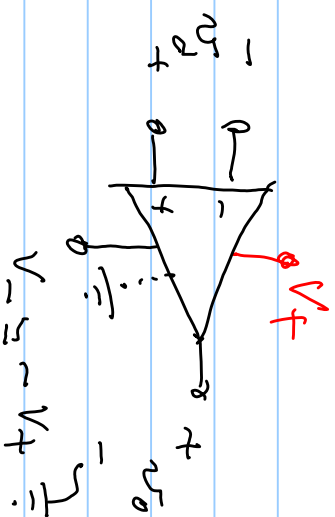


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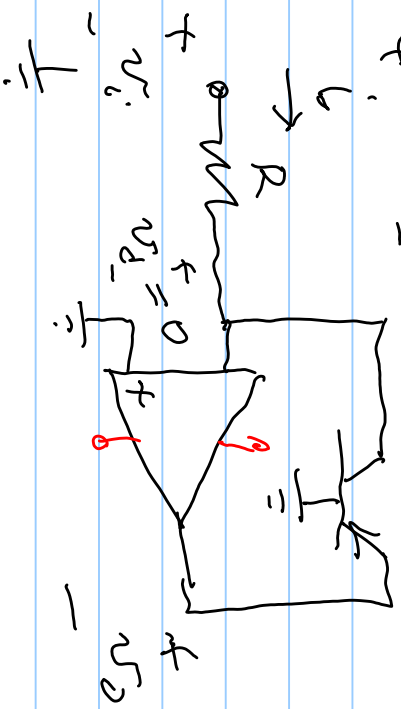
$$I_{E1} = I_{ER} \left( e^{v_{EB}/V_T} - 1 \right)$$

$$I_{C1} = I_{CR} \left( e^{v_{CB}/V_T} - 1 \right)$$

$$i_{C1} = i_{C1} \sim \alpha_F I_{E1} = -\alpha_F I_{ER} \left( e^{v_{EB}/V_T} - 1 \right)$$

$$R_i' = v_i' \quad \rightarrow \quad v_o' = v_i' \quad \rightarrow \quad v_o' = \alpha_F I_{E R} \quad (e^{-1})$$

$$v_o' = \alpha_F I_{E R} \quad (e^{-1})$$



$$\frac{\alpha_F I_{E R}}{\alpha_F I_{E R}} = e^{-1}$$

$$v_o = V_T \ln \left( 1 - \frac{\alpha_F I_{E R}}{I_{E R}} \cdot v_i' \right)$$

can add \$\alpha\_F I\_{E R}\$ or

a current source  
& get

$$v_o = V_T \ln \left( \frac{-G}{\alpha_F I_{E R}} \cdot v_i' \right)$$