3.1 Let $v_i = 120 \text{ V}$ and $R_i = 3 \Omega$ in Fig. P3.1. Calculate $P_{\text{max}}$ and determine the condition on $R_L$ such that $v \geq 110 \text{ V}$.

![Figure P3.1](image)

ANS! $1200 \text{ W}, 33 \Omega$

3.2 Let $v_i = 20 \text{ V}, R_i \geq 0$, and $R_i \geq 2 \text{ k}\Omega$ in Fig. P3.1. Calculate $P_{\text{max}}$ and determine the condition on $R_L$ such that $v \geq 19 \text{ V}$.

![Figure P3.12](image)

ANS! $0.2 \text{ W}, \leq 105 \Omega$

3.12 Figure P3.12 is the model of a voltage amplifier. Find $\mu$ needed to get $A_v = 20$ when $R_i = 1 \text{ k}\Omega$, $R_i = 4 \text{ k}\Omega$, $R_i = 100 \Omega$, and $R_i = 500 \Omega$. Then calculate the corresponding value of the current gain $A_i = \frac{I_{\text{out}}}{I_{\text{in}}}$.

![Figure P3.12](image)

ANS! $\mu = 30$

$A_v = 200$

3.19 Let both stages in Fig. P3.19 have $R_i = 5 \text{ k}\Omega$, $\mu = -40$, and $R_i = 200 \Omega$. What value of $R_L$ yields $A_v = 500$ when $R_i = 3 \text{ k}\Omega$?

![Figure P3.19](image)

HINT! ASSUME SOME VALUE FOR $v_s$

ANS! $R_L = 217 \Omega$