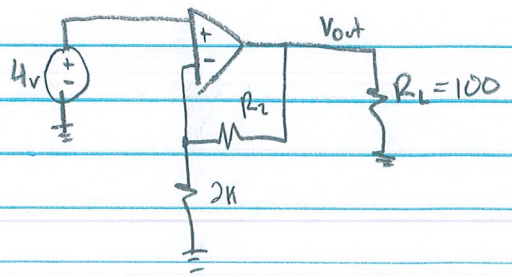
4.2




c) Find $R_2$ s.t. $P_L = 4w$. $\quad P_L = V_o^2/100 = 4w.$

$\rightarrow V_o = \pm 20v.$

Non-inverting: $M = 1 + R_f/R_1 = V_o/V_{in} = 20/4 = 5.$

$5 = 1 + R_2/2000$

$\rightarrow \boxed{R_2 = 8000\,\Omega}$

b) Now $R_2 = 13K\Omega$. Find $R_1$ for $P_L = 450mW$. $\quad P_L = V_o^2/2000$

$R_L = 2K\Omega$. $\quad \rightarrow V_o = \pm 30v.$

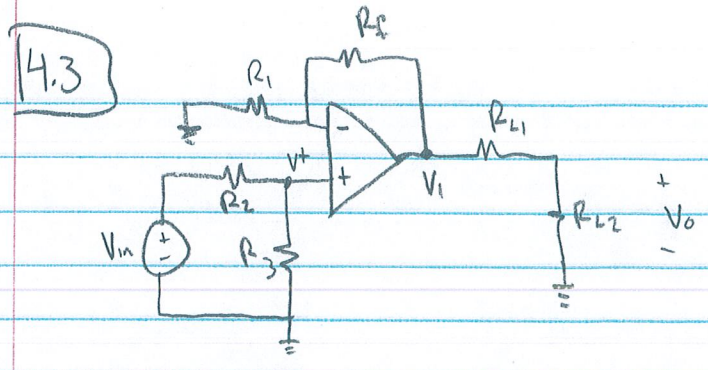
$M = 1 + 13K/R_1 = 30/4$

$\rightarrow \boxed{R_1 = 2000\,\Omega}$

$$P_{R_2} = \frac{(V_o - 4v)^2}{R_2} = \frac{(30-4)^2}{13000} = \boxed{52\,mW}$$

$$P_{R_1} = \frac{(4v)^2}{2000\Omega} = \boxed{8\,mW}$$

4.3




$$V_+ = V_{in}\left(\frac{R_3}{R_2+R_3}\right) \rightarrow \boxed{\frac{V_+}{V_{in}} = \frac{R_3}{R_2+R_3}}$$

KCL at − input: $\frac{V_+}{R_1} + \frac{V_+ - V_1}{R_f} = 0 \rightarrow V_+\left(\frac{1}{R_1}+\frac{1}{R_f}\right) = \frac{V_1}{R_f}$

$$V_1 = V_+ R_f\left(1/R_1 + 1/R_f\right)$$

$$V_o = V_1\left(\frac{R_{L2}}{R_{L1}+R_{L2}}\right) = \frac{V_{in} R_3}{R_2+R_3} R_f\left(1/R_1 + 1/R_f\right)\left(\frac{R_{L2}}{R_{L2}+R_{L3}}\right)$$

$$\boxed{\frac{V_o}{V_{in}} = \frac{R_3\left(R_f/R_1+1\right)}{\left(R_2+R_3\right)} \frac{R_{L2}}{\left(R_{L2}+R_{L3}\right)}}$$