Pset 3

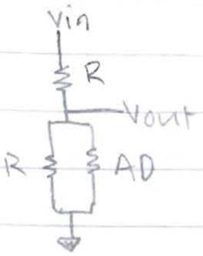
1)

Circuit (Ω)	Vout calculated	Vout measured
10k	2.5 V	2.55 V
100k	2.5 V	2.45 V
1M	2.5 V	1.73 V

V_{in} assumed = 5V

V_{in} actual = 5.14V

2)



$R_p = \frac{1}{\frac{1}{R}+\frac{1}{AD}} = \frac{R \cdot AD}{R + AD}$

Vout Vin R

solve for R_p then AD

$V_{out} = \frac{V_{in} \cdot R_p}{R_p + R}$

$V_{out}(R_p + R) = V_{in} R_p$

$V_{in} R_p - V_{out} R_p = V_{out} R$

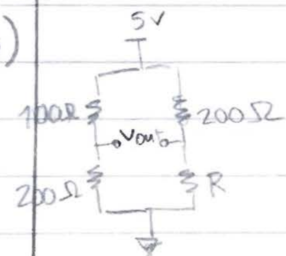
$R_p = V_{out} \cdot R / (V_{in} - V_{out})$

$AD = \frac{R R_p}{R - R_p}$

Circuit (Ω)	R_p from Vout measured	AD from R_p
10k	$9.85 \cdot 10^3 \Omega$	$6.57 \cdot 10^5 \Omega$
100k	$9.11 \cdot 10^4 \Omega$	$1.02 \cdot 10^6 \Omega$
1M	$5.07 \cdot 10^5 \Omega$	$1.03 \cdot 10^6 \Omega$

impedance of AD: approximately $\boxed{1.02 M\Omega}$

3)



for $\Delta V = 0$, $V_{left} = V_{in} \cdot \frac{200}{300}$ and $V_{left} = V_{right}$

$V_{right} = V_{in} \cdot \frac{R}{200+R}$

$\frac{200}{300} = \frac{R}{200+R}$ $\quad \frac{2}{3}(200+R) = R$ $\quad \boxed{R = 400\Omega}$

4)

1. $I_a = I_b + I_c$
2. Equal; $R_s = \Sigma R$
3. Lower; $R_p = 1/\Sigma(1/R)$
4. $V \propto R$ so Vout lower. $I \propto 1/R$ so I_a higher.