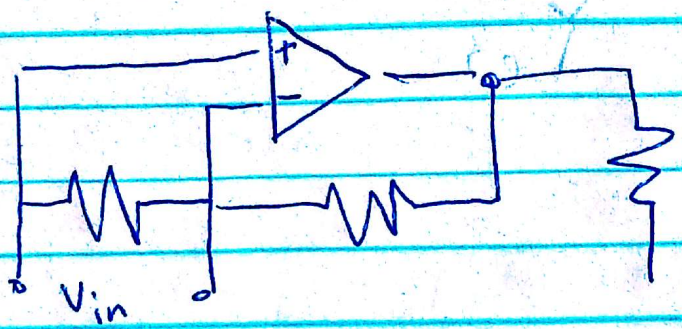
1. a)



$$\frac{V_{out} - V_s}{R_2} = \frac{V_s - 0}{R_1} \qquad V_{out} = V_s\left(\frac{R_2}{R_1} + 1\right)$$

$$V_x = V_s$$

$$V_{out} = A(V_+ - V_-)$$
$$= A\left(V_s\left(\frac{R_2}{R_1} + 1\right)\right)$$

b) limit as A → ∞ is ∞ when there isn't negative feed back. when there is, it is V_s

2. a) $I_s = i_1$

$i_1 = i_2$

$i_2 = I_s$

Yes

b) $V_0 = 0$

$\frac{V_1 - V_0}{R_1} = I_s$

$V_1 = I_s R_1$

$\frac{V_2 - V_1}{R_2} = I_s$

$V_2 - I_s R_1 = I_s R_2$

$V_2 = I_s R_1 + I_s R_2$

$\frac{V_3 - V_2}{R_3} = I_s$

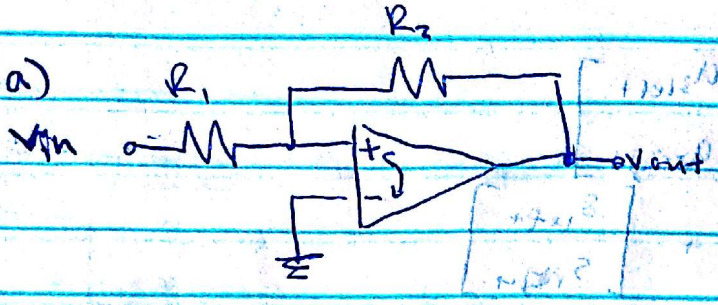
$V_3 = I_s R_1 + I_s R_2 + I_s R_3$

c)

d) 1 Ω

e) plug in the numbers to the equations found in part b and see if they satisfy them

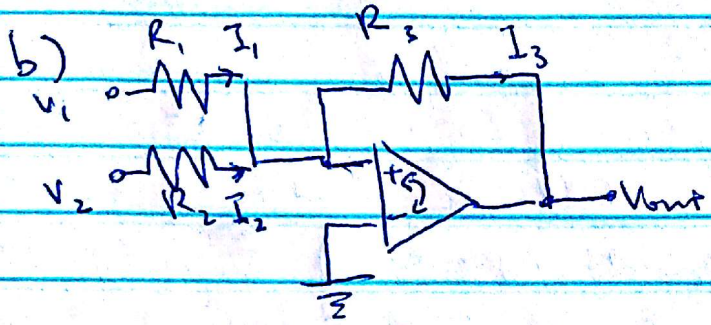
3. a)



$$\frac{V_{out} - V_+}{R_2} = \frac{V_+ - V_{in}}{R_1}$$

$$V_{out} = -\frac{R_2}{R_1} V_{in}$$

b)



$$I_3 = I_1 + I_2$$

$$\frac{-V_1}{R_1} + \frac{-V_2}{R_2} = \frac{V_{out}}{R_3}$$

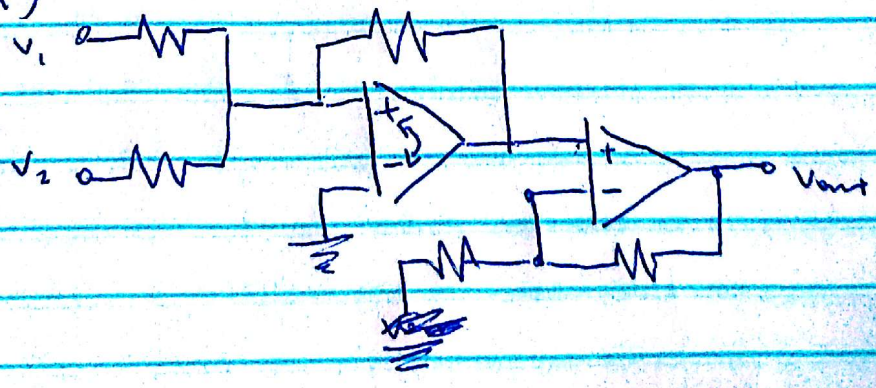
$$V_{out} = -R_3\left(\frac{V_1}{R_1} + \frac{V_2}{R_2}\right)$$

c) $R_3 = 2$

$R_1 = 8$

$R_2 = 1$

d)



5. Brian Ho 3031837576
worked during homework party

4. a) $\begin{bmatrix} a_{1,left} & a_{2left} & a_{3left} \\ a_{1,right} & a_{2right} & a_{3right} \end{bmatrix}$

b) $\vec{s}_{ear} = \vec{s}_{noise} + \begin{bmatrix} s_{left} \\ s_{right} \end{bmatrix}$

c) $\begin{bmatrix} -a_{1,left} & -a_{2left} & -a_{3left} \\ -a_{1,right} & -a_{2right} & -a_{3right} \end{bmatrix} R = A$

d)