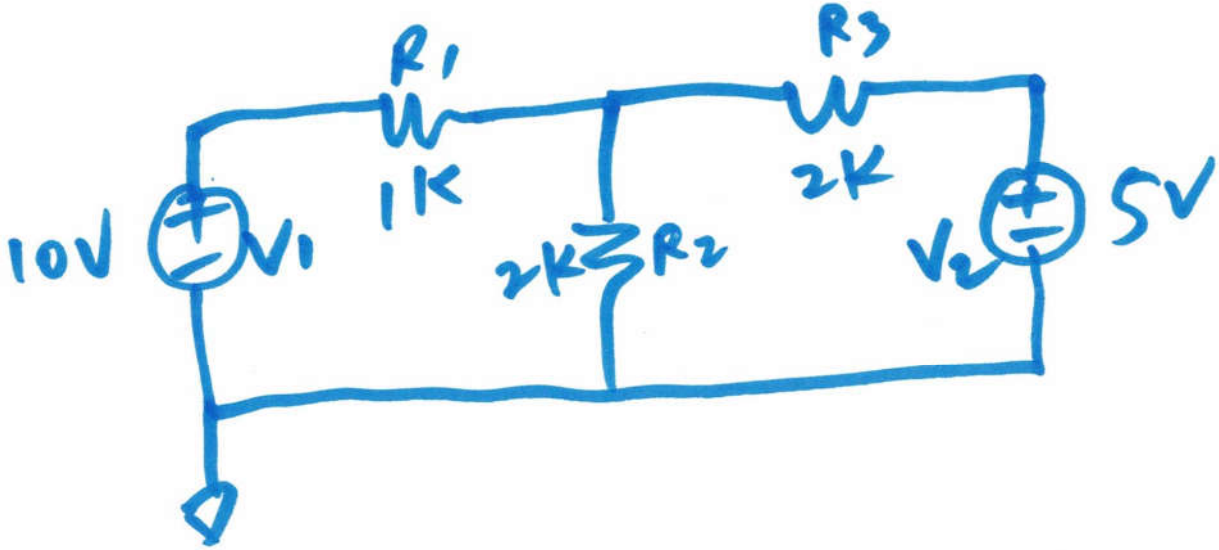
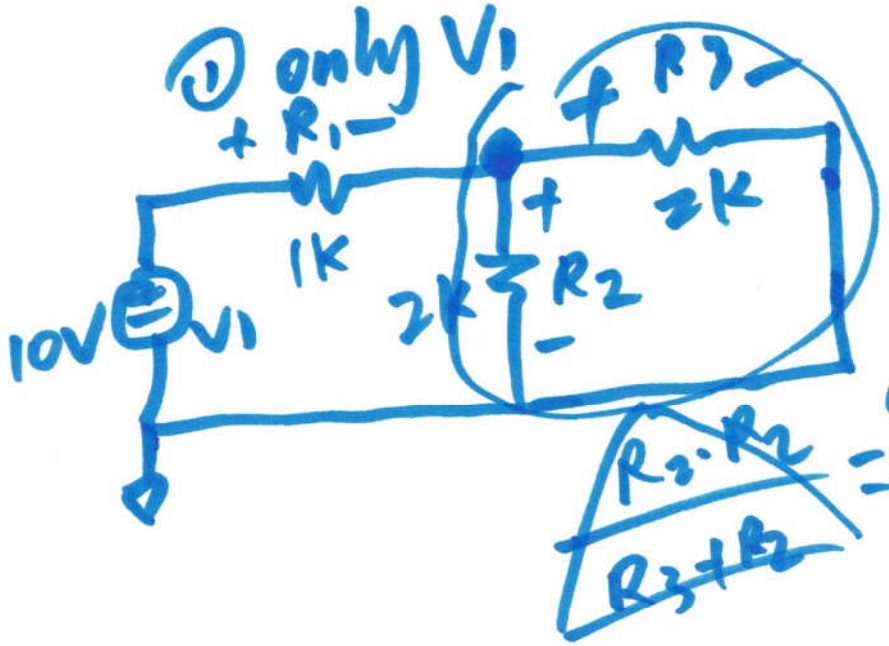
Superposition



① only V1



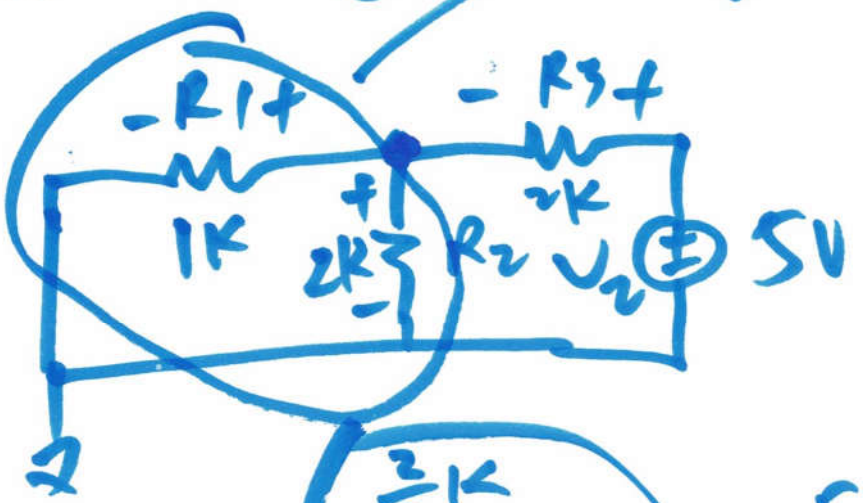
$V_{R1} = 5V, \quad V_{R2} = 5V = V_{R3}$

$I_{R1} = \frac{V_{R1}}{1K} = 5mA$

$I_{R2} = \frac{V_{R2}}{2K} = 2.5mA$

$I_{R3} = 2.5mA$

② V_2 only $\Rightarrow R_{eq} = \frac{1K \cdot 2K}{1K+2K} = \frac{2}{3}K$

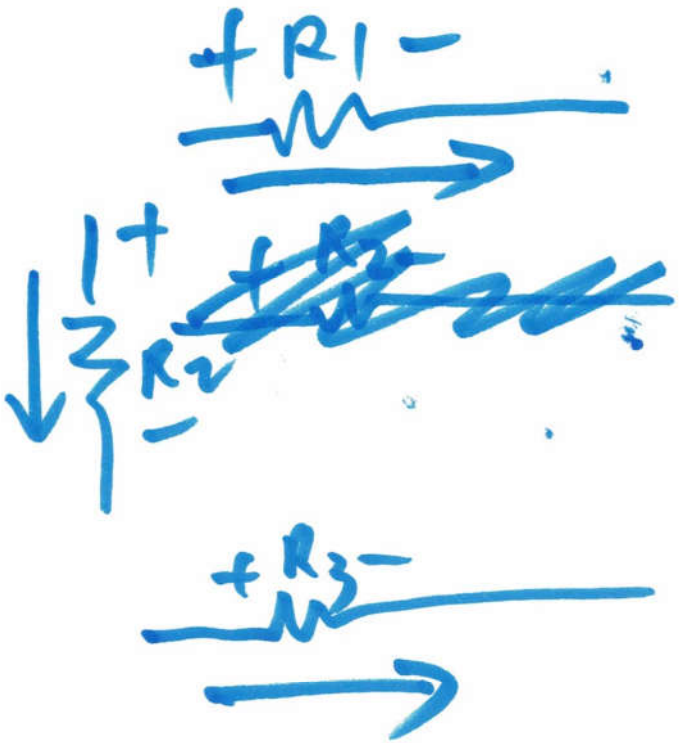


$V_{R1} = 5 \cdot \frac{\frac{2}{3}K}{2K + \frac{2}{3}K} = 5 \cdot \frac{0.67K}{2.67K} = 1.25V$

$V_{R2} = V_{R1} = 1.25V$, $V_{R3} = 5 \cdot \frac{2K}{2.67K} = 3.75V$ ~~0.75V~~

$I_{R1} = \frac{V_{R1}}{1K} = 1.25mA$, $I_{R2} = \frac{1.25V}{2K} = 0.625mA$

$I_{R3} = \frac{V_{R3}}{2K} = \frac{3.75V}{2K} = 1.875mA$



$V_{R1} = 5V - 1.25V = 3.75V$

$V_{R2} = 5V + 1.25V = 6.25V$

$V_{R3} = 5V - 3.75V = 1.25V$

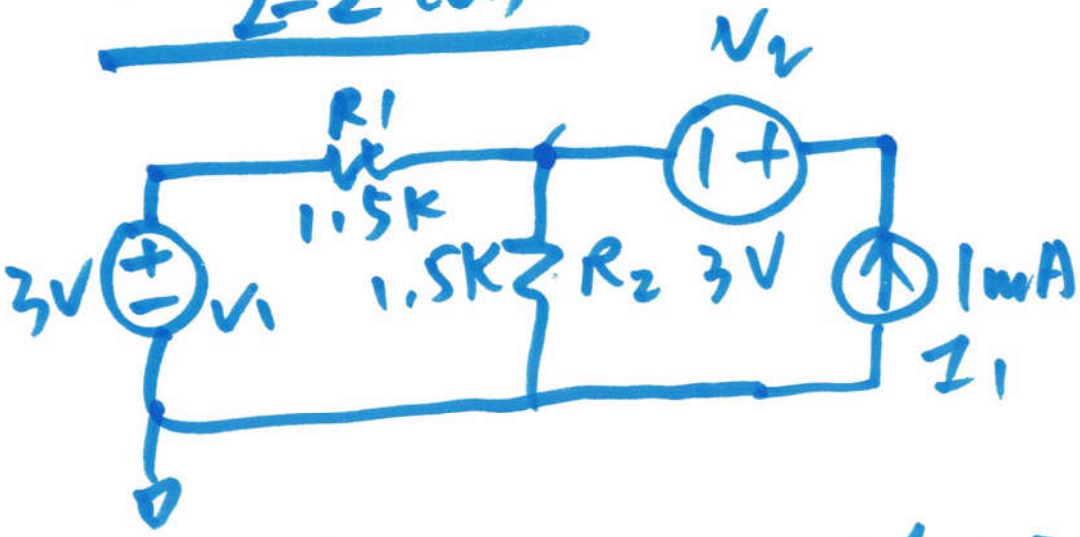
$I_{R1} = 5mA - 1.25mA = 3.75mA$

$I_{R2} = 2.5mA + 0.625mA = 3.125mA$

$I_{R3} = 2.5mA - 1.875mA$

$= 0.625mA$

2-2 (a)

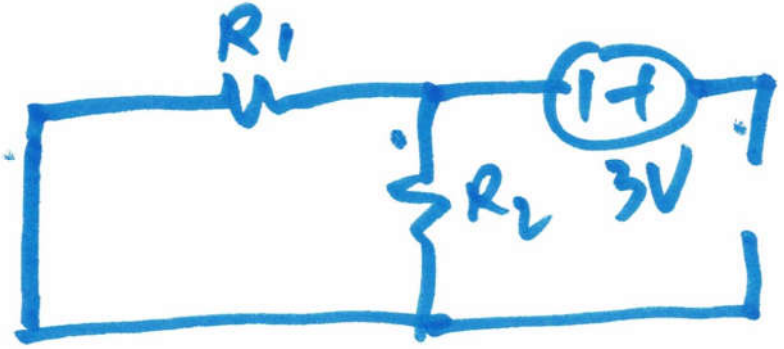


① V_1 only:

$V_{R1} = 1.5V$, $V_{R2} = 1.5V$

$I_{R1} = 1mA$, $I_{R2} = 1mA$

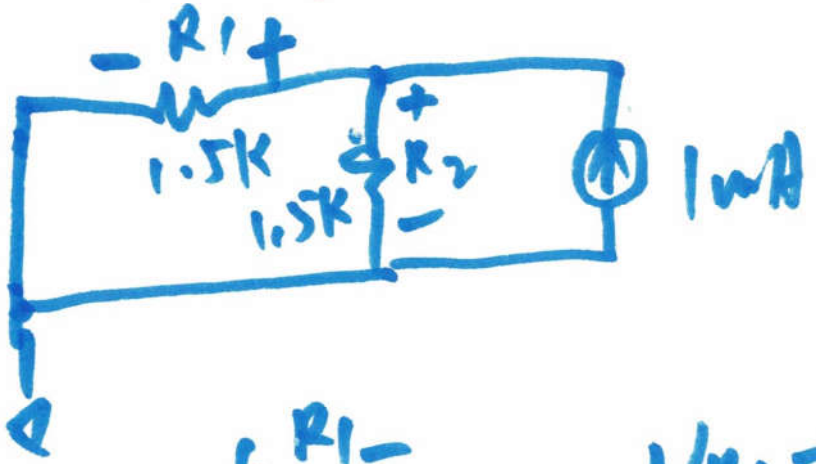
② ~~V1~~ V_2 only



$V_{R1} = 0V = V_{R2}$

$I_{R1} = 0 = I_{R2}$

③ I_1 only

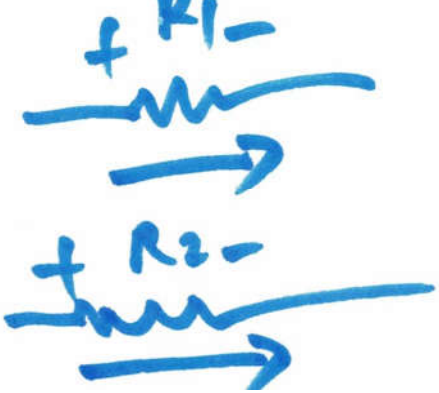


$V_{R1} = 0.5mA \cdot 1.5K = 0.75V$

$V_{R2} = V_{R1} = 0.75V$

$I_{R1} = 0.5mA = I_{R2}$

So,



$V_{R1} = 1.5V - 0.75V = 0.75V$

$V_{R2} = 1.5V + 0.75V = 2.25V$

$I_{R1} = 1mA - 0.5mA = 0.5mA$

$I_{R2} = 1mA + 0.5mA = 1.5mA$