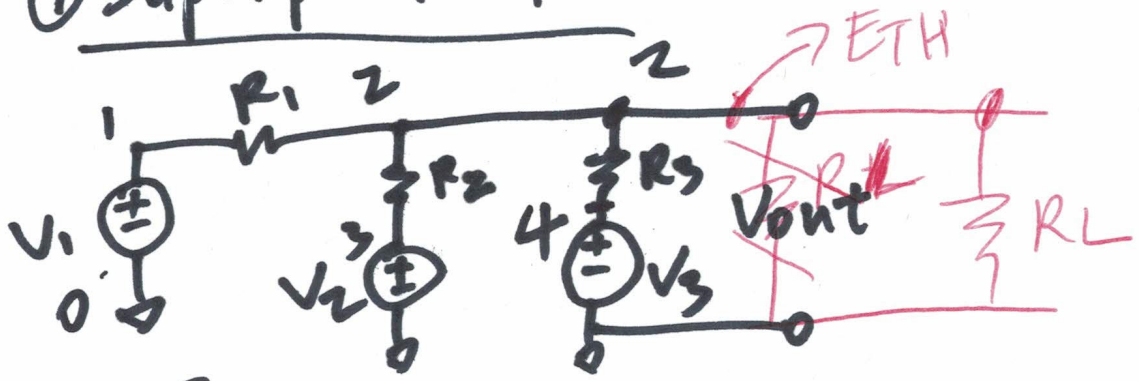
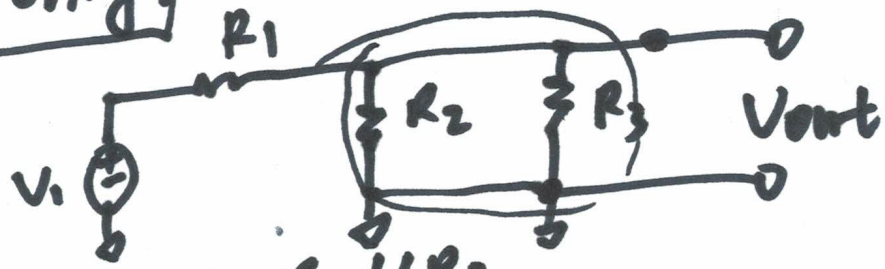
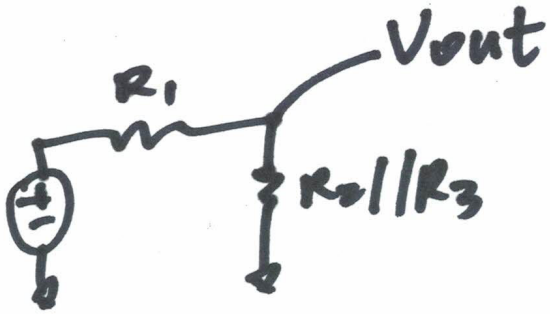
① Superposition



Vout?

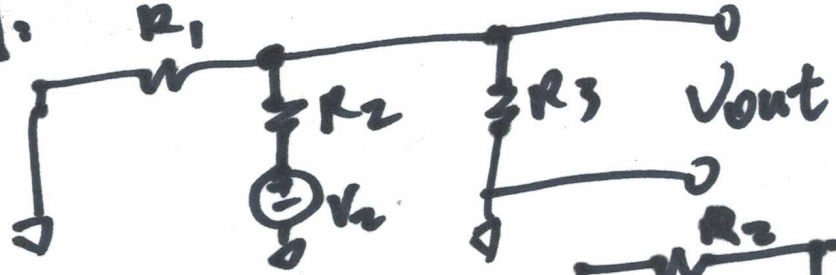
V1 only:

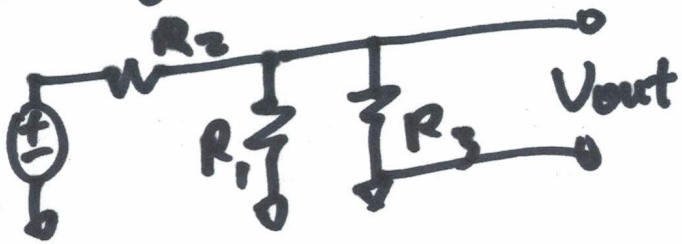




$$V_{out_1} = V_1 \cdot \frac{R_2 // R_3}{R_1 + R_2 // R_3}$$

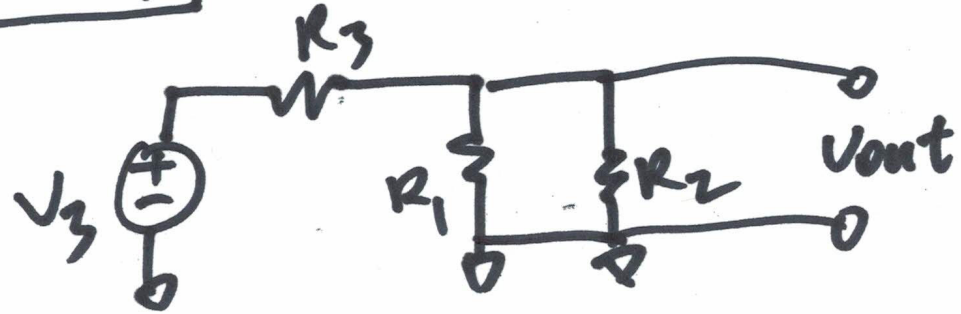
V2 only:





$$V_{out_2} = V_2 \cdot \frac{R_1 // R_3}{R_2 + R_1 // R_3}$$

V_3 only:



$$R_2 \| R_3 = \frac{R_2 \cdot R_3}{R_2 + R_3}$$

$$V_{out3} = V_3 \cdot \frac{R_1 \| R_2}{R_3 + R_1 \| R_2}$$

$$V_{out} = V_{out1} + V_{out2} + V_{out3}$$

$$= V_1 \cdot \frac{R_2 \| R_3}{R_1 + R_2 \| R_3} + V_2 \cdot \frac{R_1 \| R_3}{R_2 + R_1 \| R_3} + V_3 \cdot \frac{R_1 \| R_2}{R_3 + R_1 \| R_2}$$

△ Example: $R_1 = 2K$, $R_2 = 4K$, $R_3 = 6K$, $V_1 = 2V$, $V_2 = 4V$, $V_3 = 6V$

$$V_{out} = 2 \cdot \frac{2.4K \cdot K}{4.4K} + 4 \cdot \frac{1.5K \cdot K}{5.5K} + 6 \cdot \frac{1.3K \cdot K}{7.3K}$$

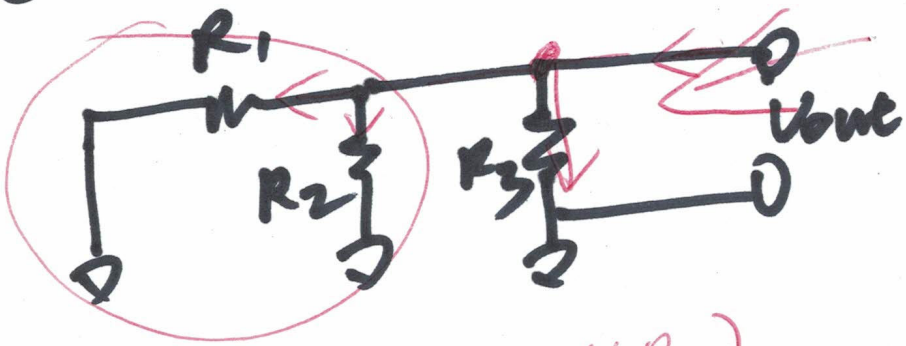
$$= 1.1 + 1.1 + 1.07 = 3.27V$$

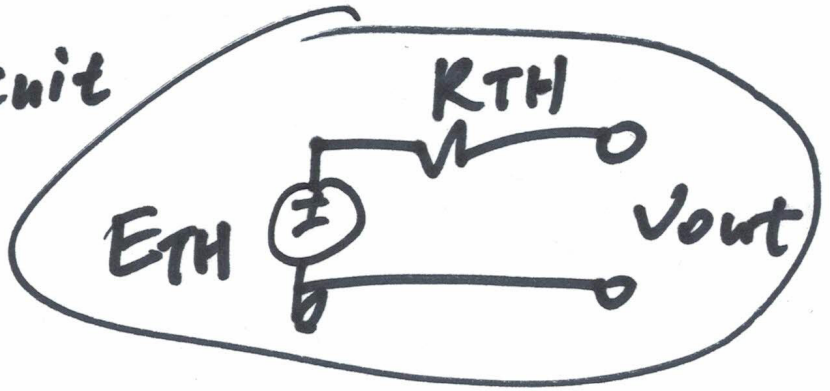
LTspice Code:

```
V1 1 0 2
R1 1 2 2K
R2 2 3 4K
V2 3 0 4
R3 2 4 6K
V3 4 0 6
.tran 1
```

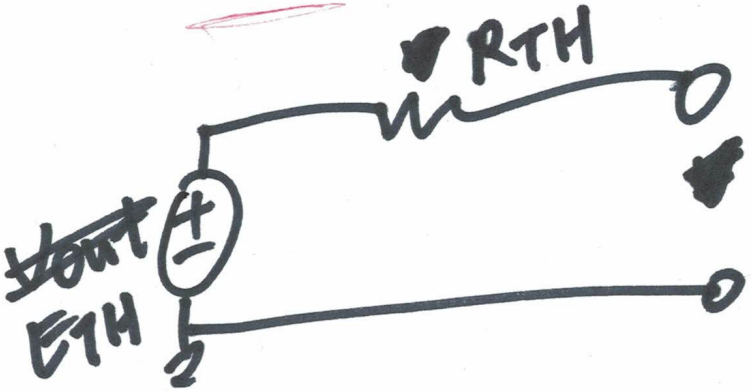
↑ Run it in LTspice

② Thevenin's Equivalent Circuit





$R_{TH} = R_3 \,//\, (R_1 \,//\, R_2)$



③ PULSE ( )

(Low voltage | High voltage | Delay | Rising time | Falling time | On time | Period)