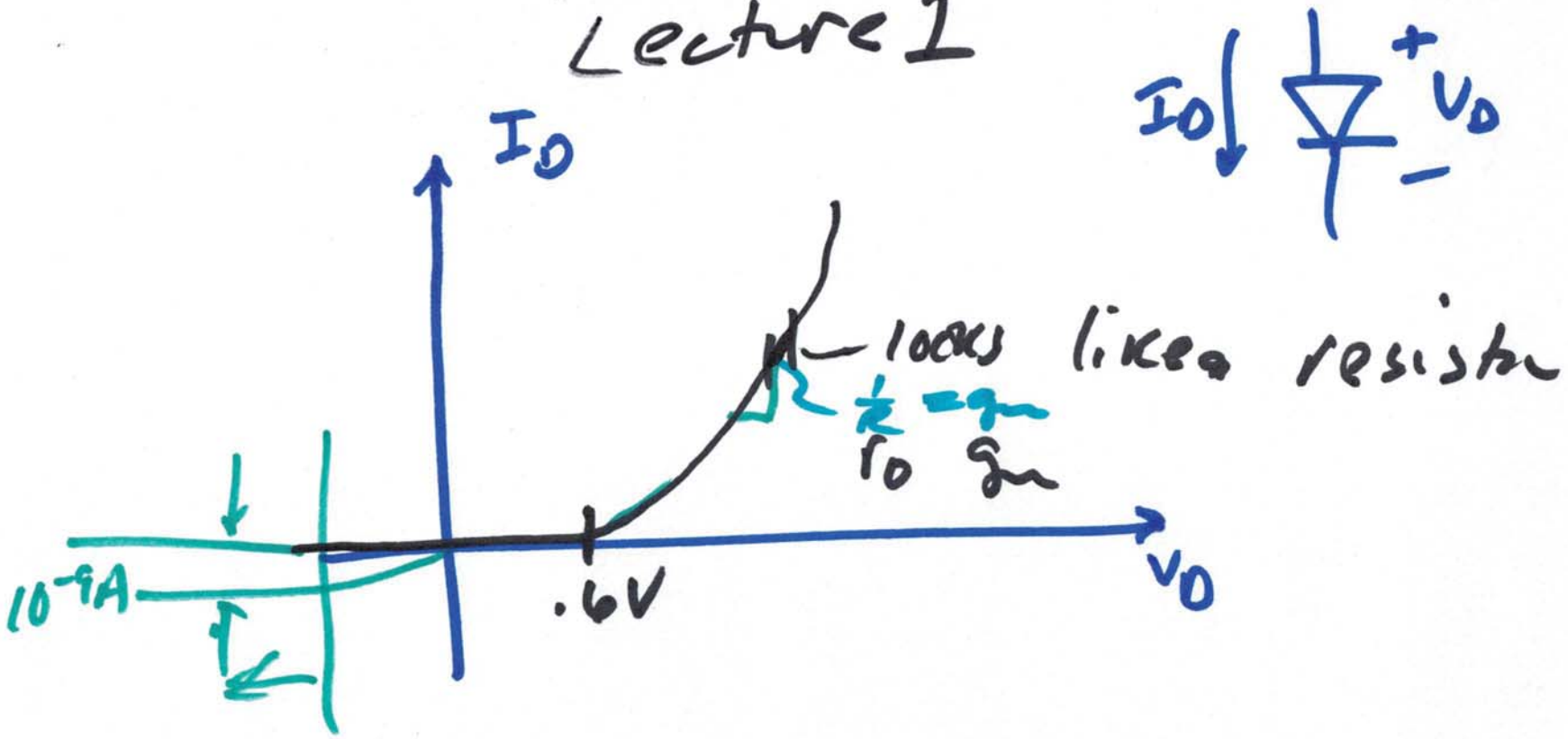
EE 420/ECG 620

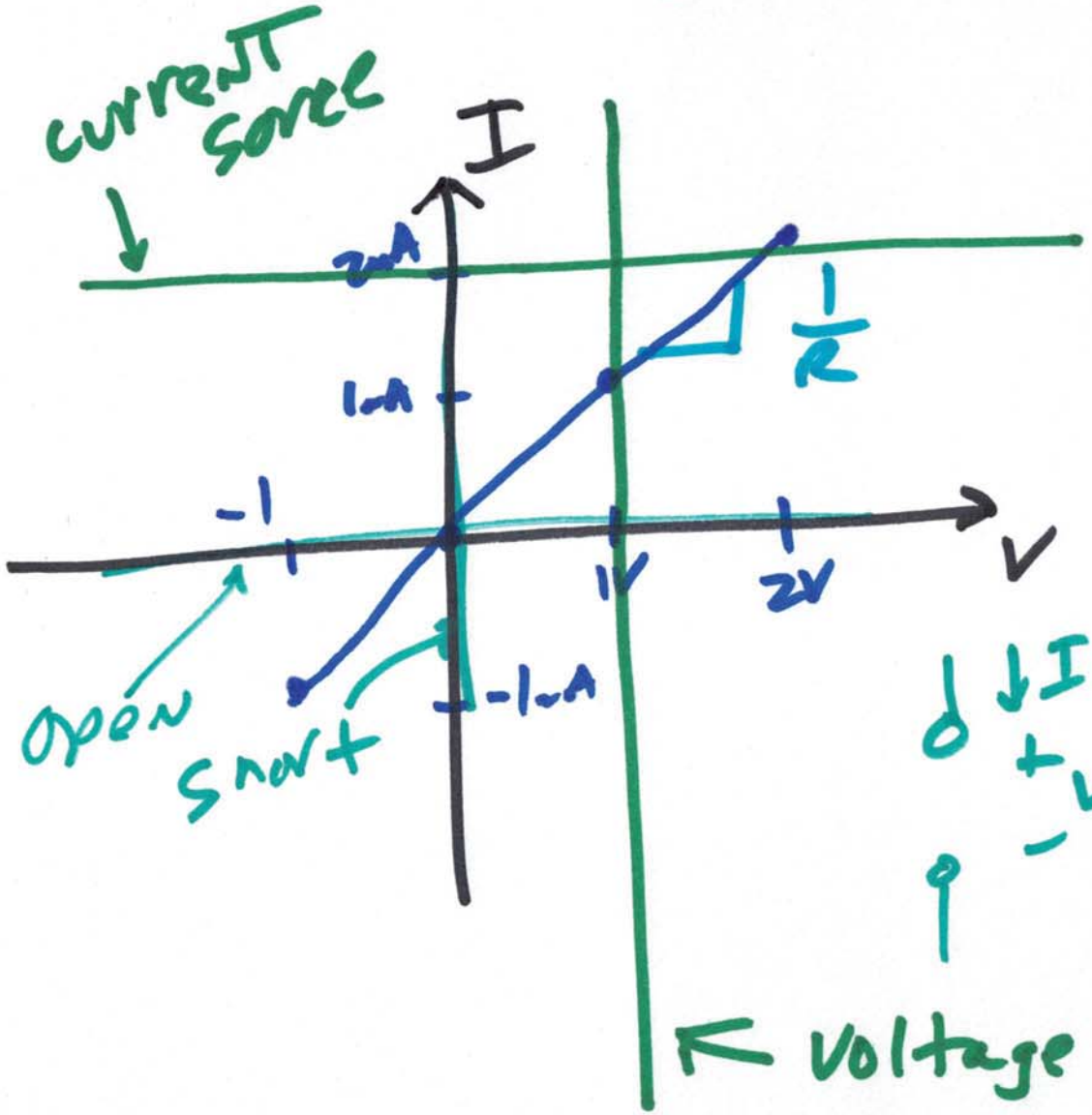
Analog IC Design

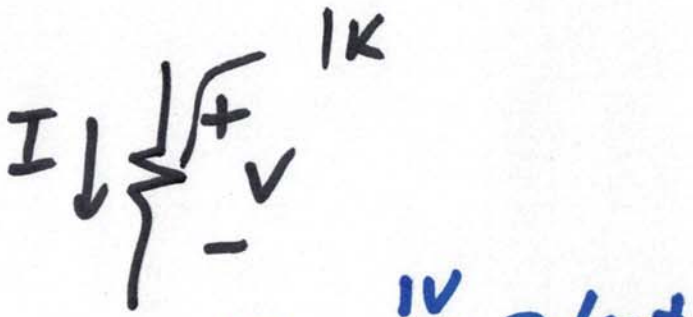
Jan. 22, 2020

Lecture 1

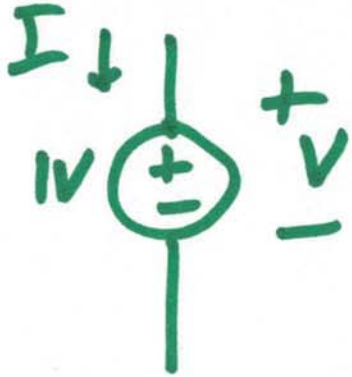


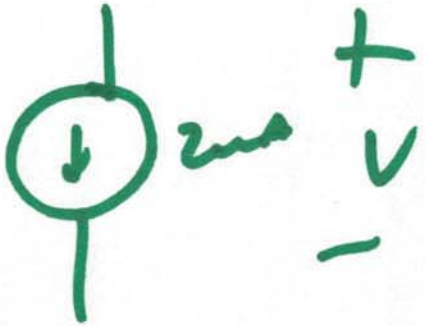
IV curves



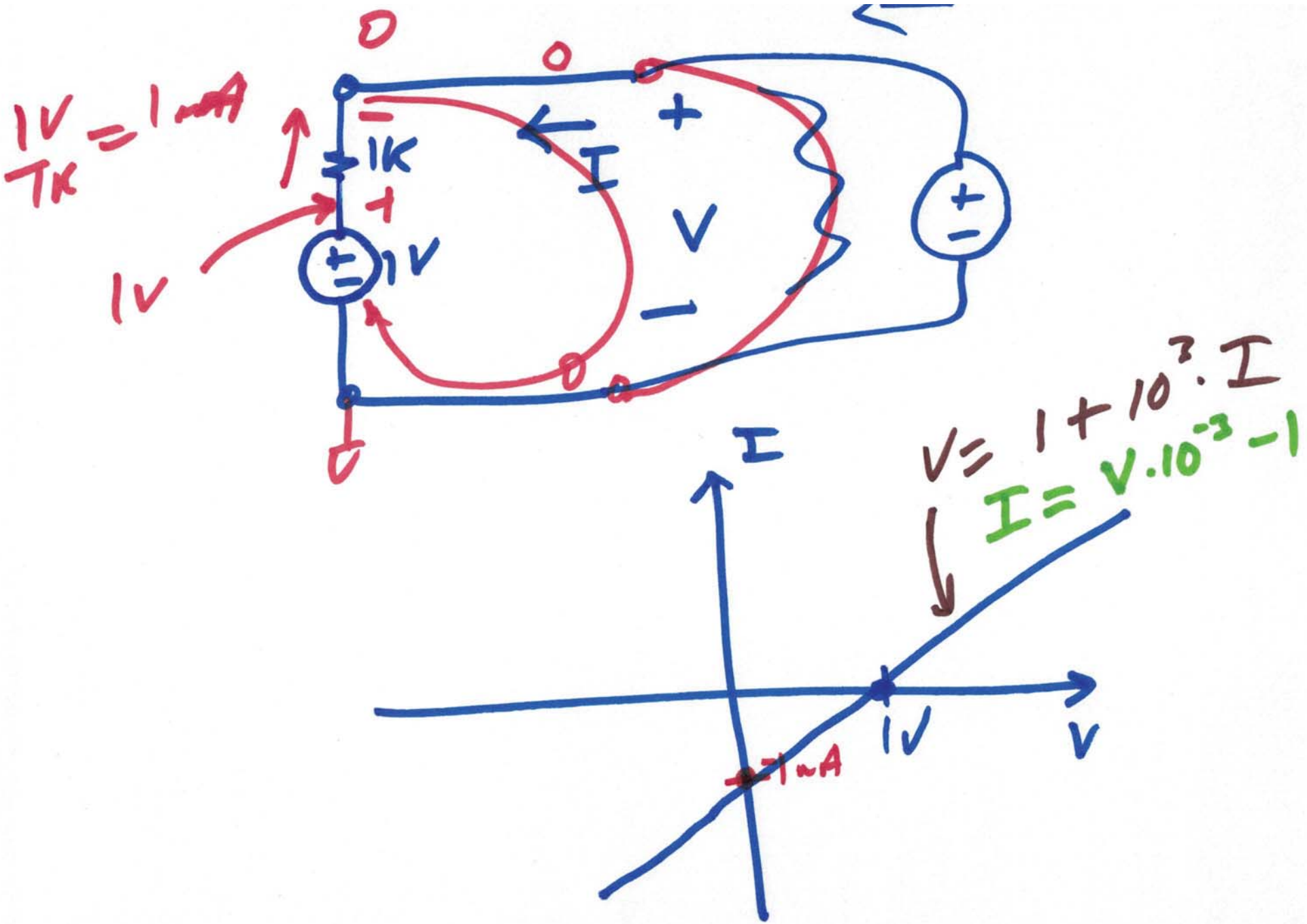


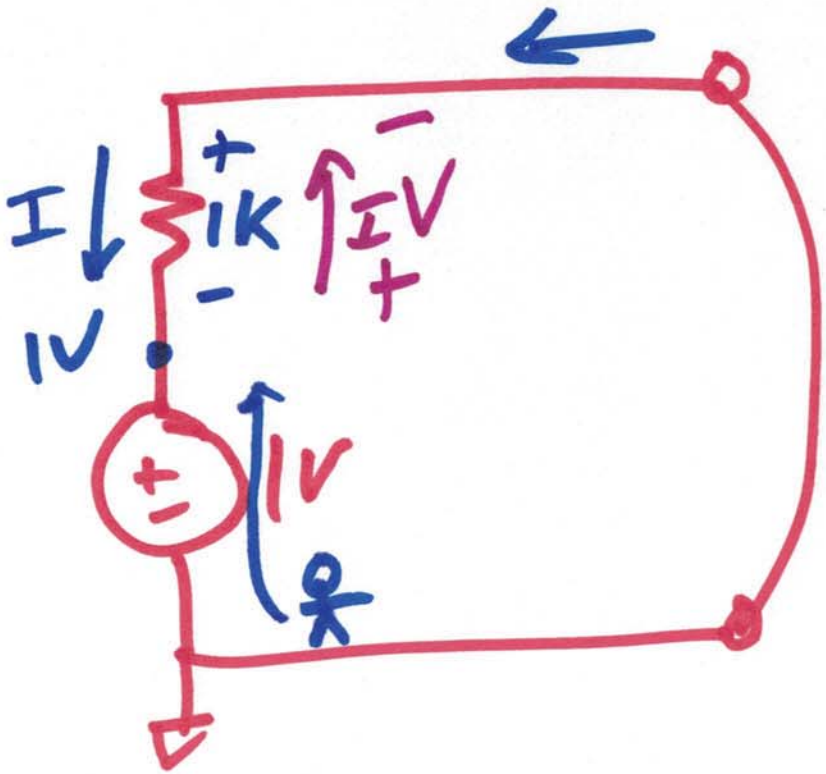
$$I = \frac{1V}{1K} = 1mA$$





← Voltage source

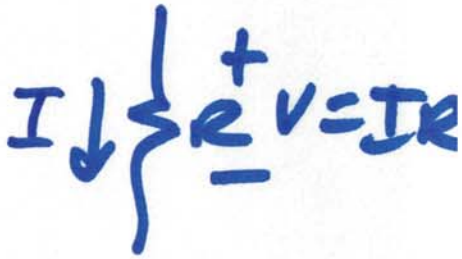

1V = 1mA
1K
1V
1V
I
V
+
−
I
V
1V
−1mA
V = 1 + 10^3 . I
I = V.10^-3 - 1



+

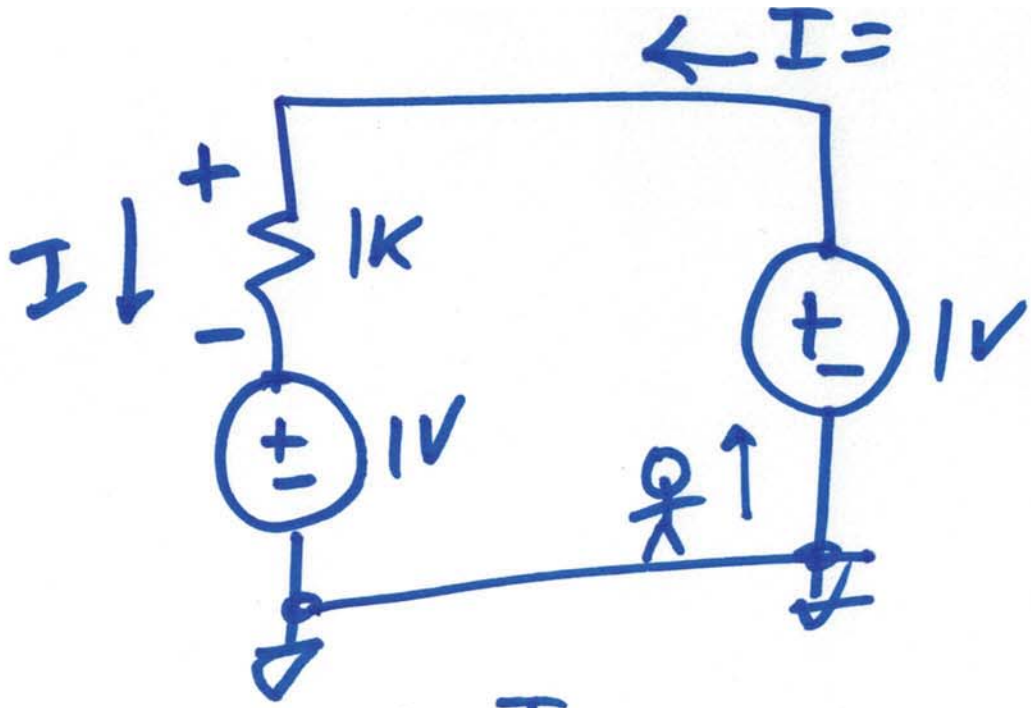
V = 0

−



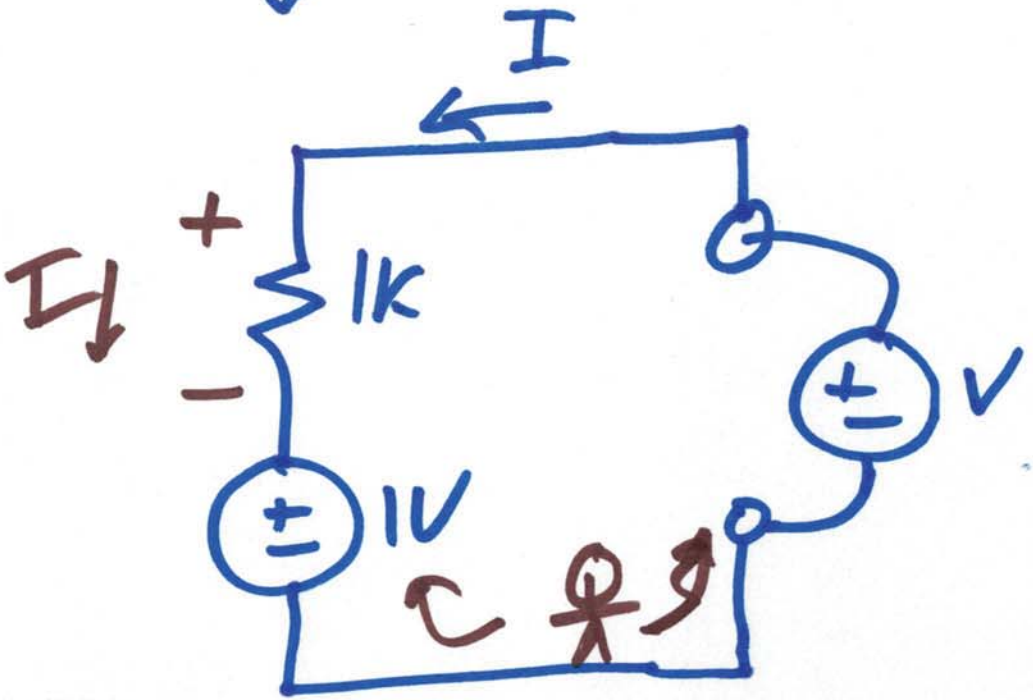
$+1V + I \cdot 1K = 0 \;,\; I = -1mA$

$+1V - I \cdot 1K = 0 \;,\; I = 1mA$



$$1V - I \cdot 1K - 1V = 0$$

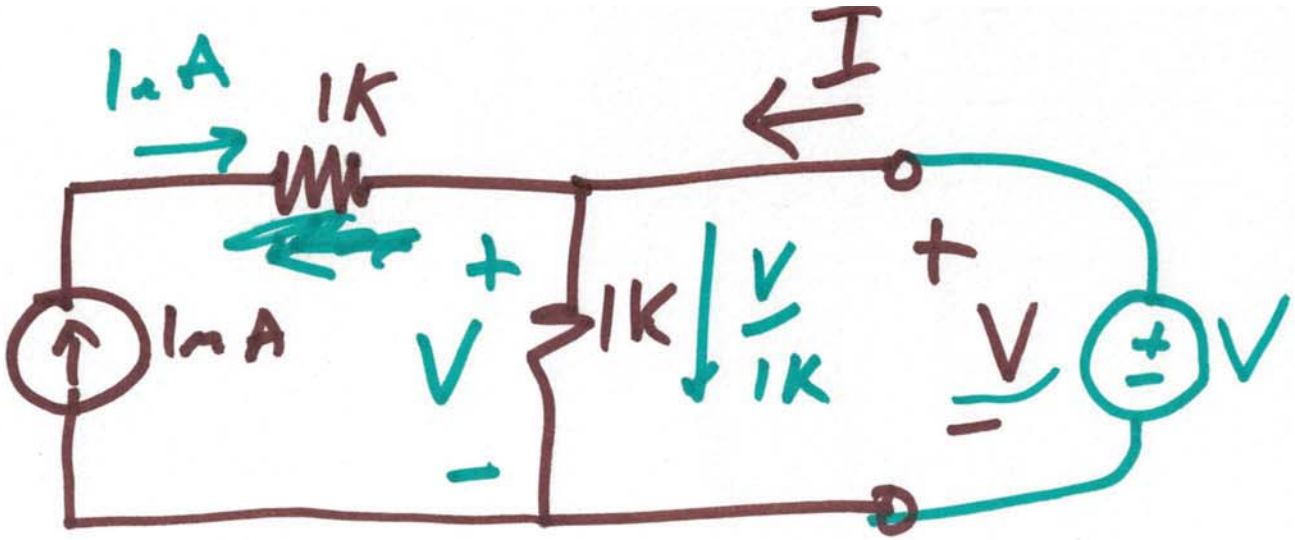
$$I = 0$$



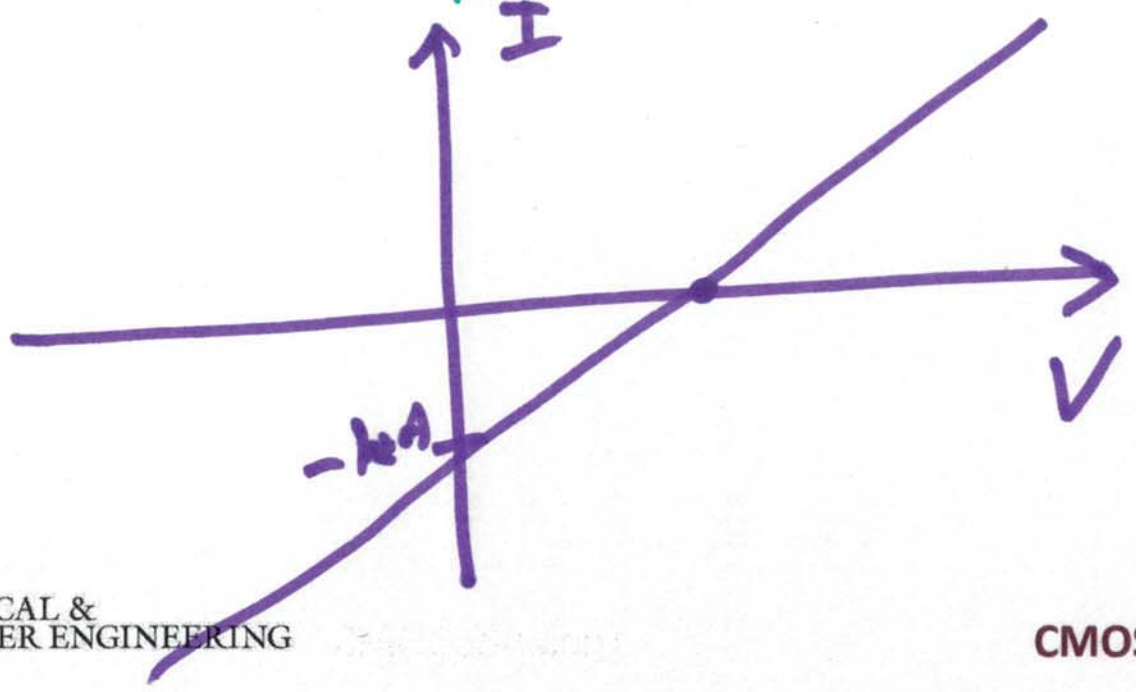
$$1 + I \cdot 1K - V = 0$$

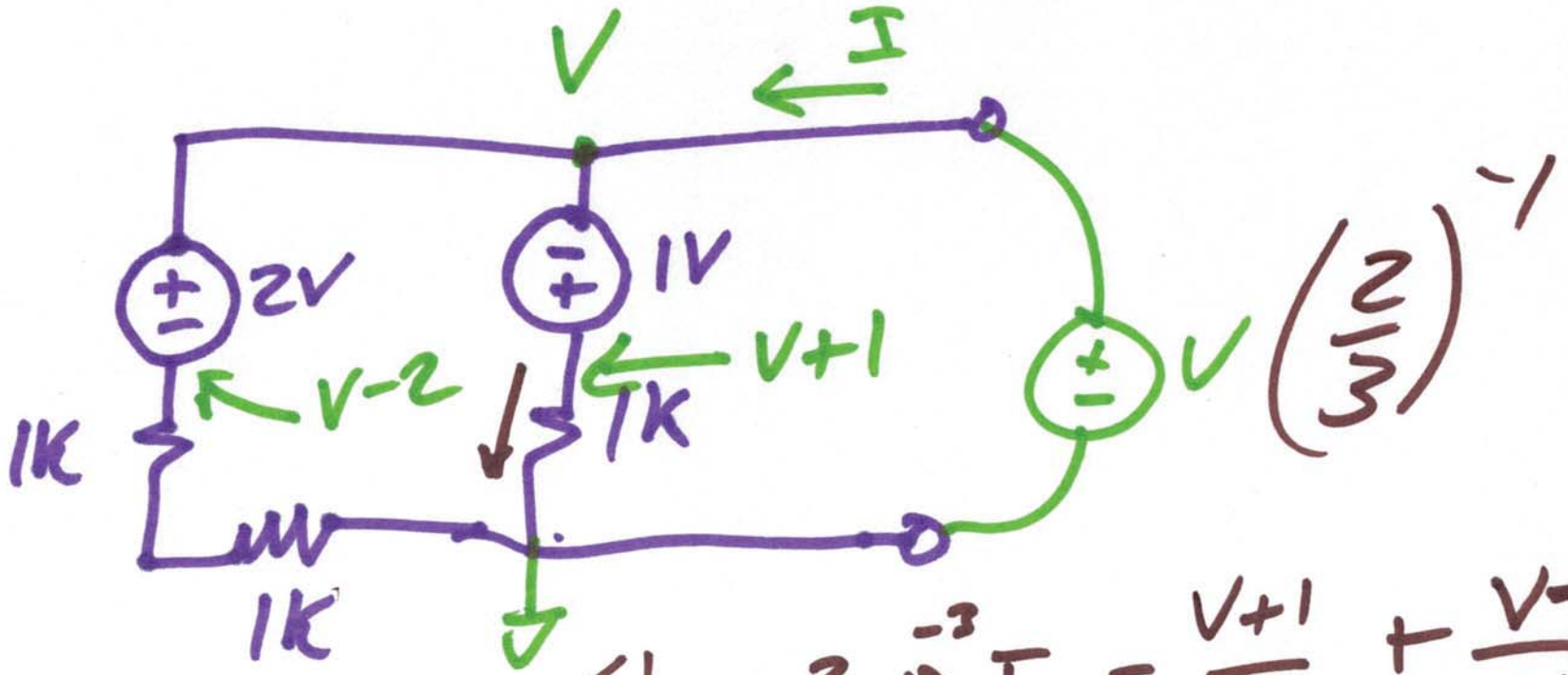
$$V = 1 + 10^{3} \cdot I$$

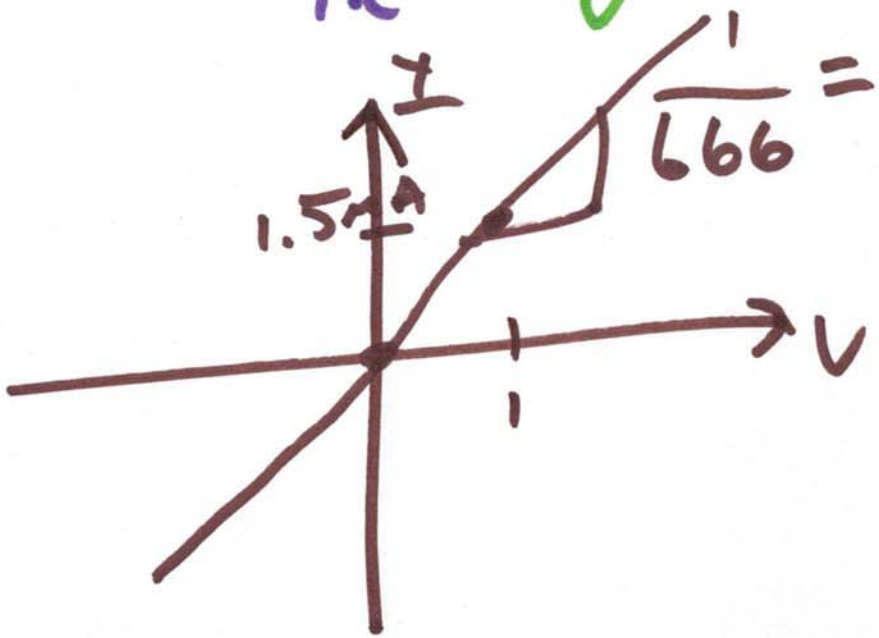
$$I = 10^{-3} V - 1$$



$$1mA + \frac{V}{1K} = I \rightarrow I = 10^{-3}V - 1mA$$







$$\frac{1}{666} = \frac{3}{2} \cdot 10^{-3}$$

$$I = \frac{V+1}{1K} + \frac{V-2}{2K}$$

$$2KI = 2V + 2 + V - 2$$

$$V = \frac{2}{3} K I$$

$$\boxed{V = 666\, I}$$

$$I = \frac{1}{666} \cdot V$$

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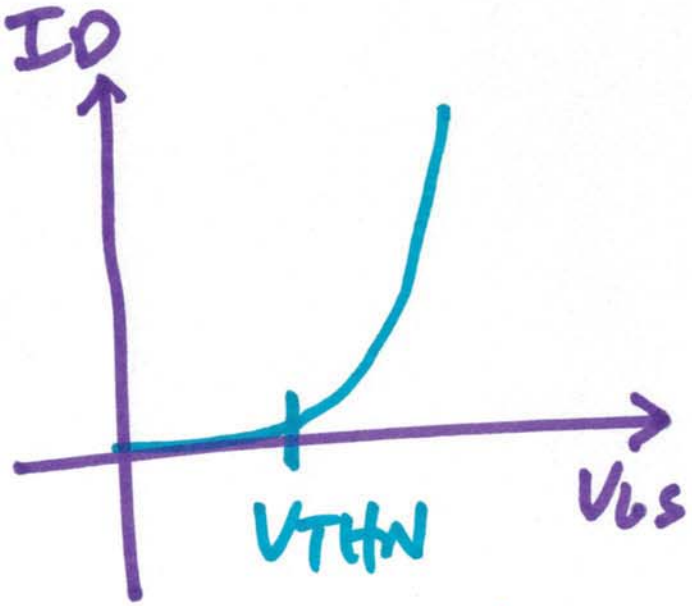
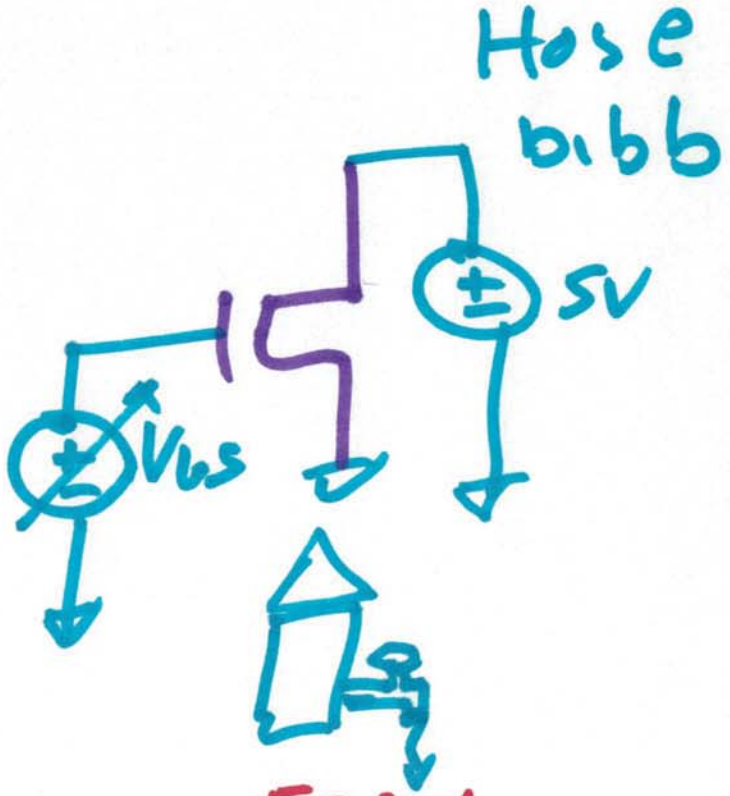


$\frac{3}{4}$ turn



$V_{THN} = 0.8V$

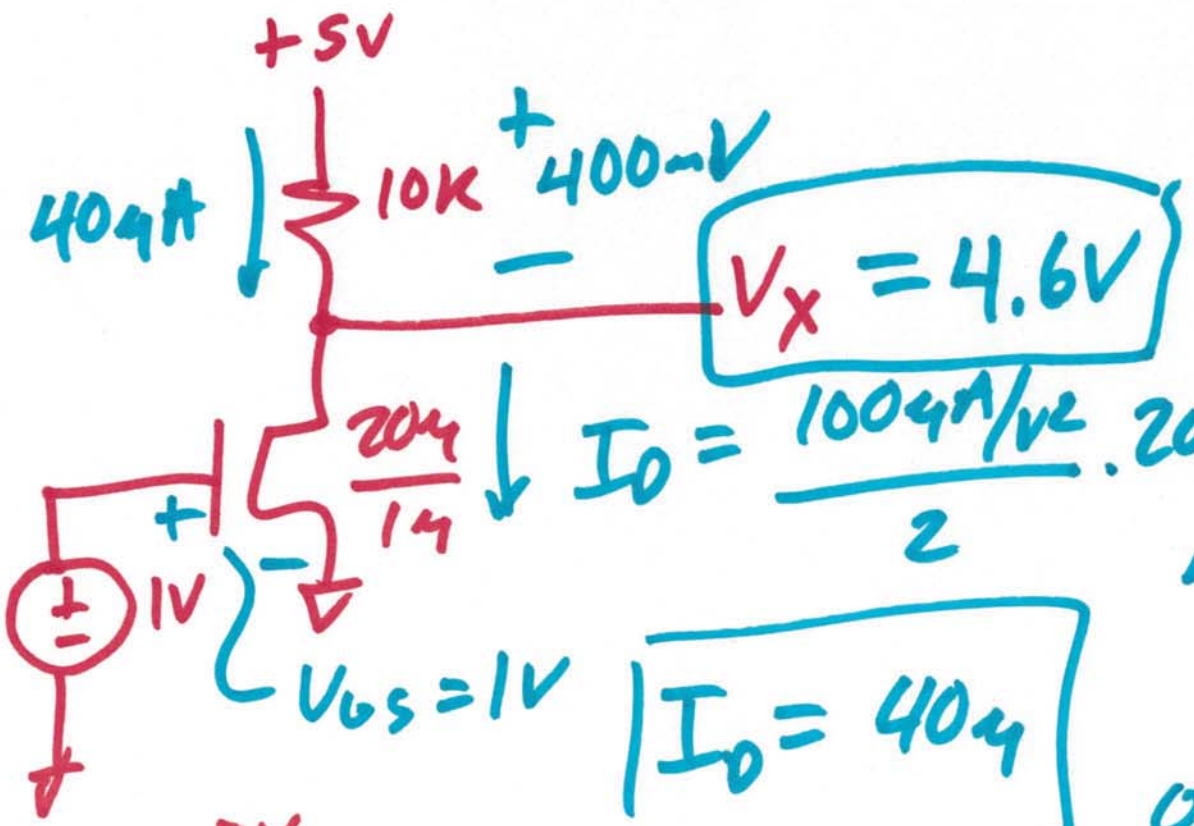
$KP = \frac{.525mA}{5} = \frac{100\mu A}{V^2}$

KP .525mA

$I_D = \frac{KP_N}{2} \frac{W}{L} (V_{GS} - V_{THN})^2$

10 1.8 .8V

$\frac{10\mu}{1\mu}$



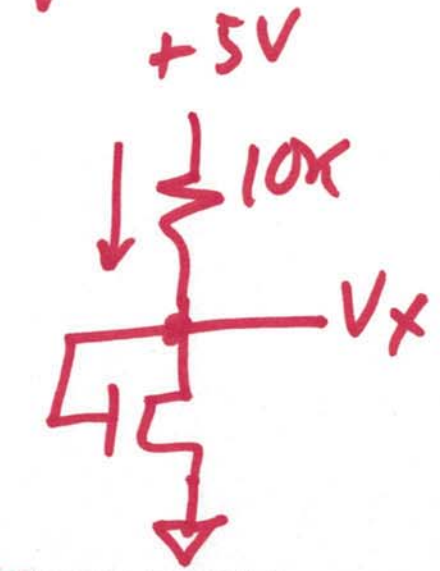
$$I_D = \frac{100\mu A/V^2}{2} \cdot 20 (1 - .8)^2$$

$$.2^2 = 0.04$$

$$0.04 \times 20$$

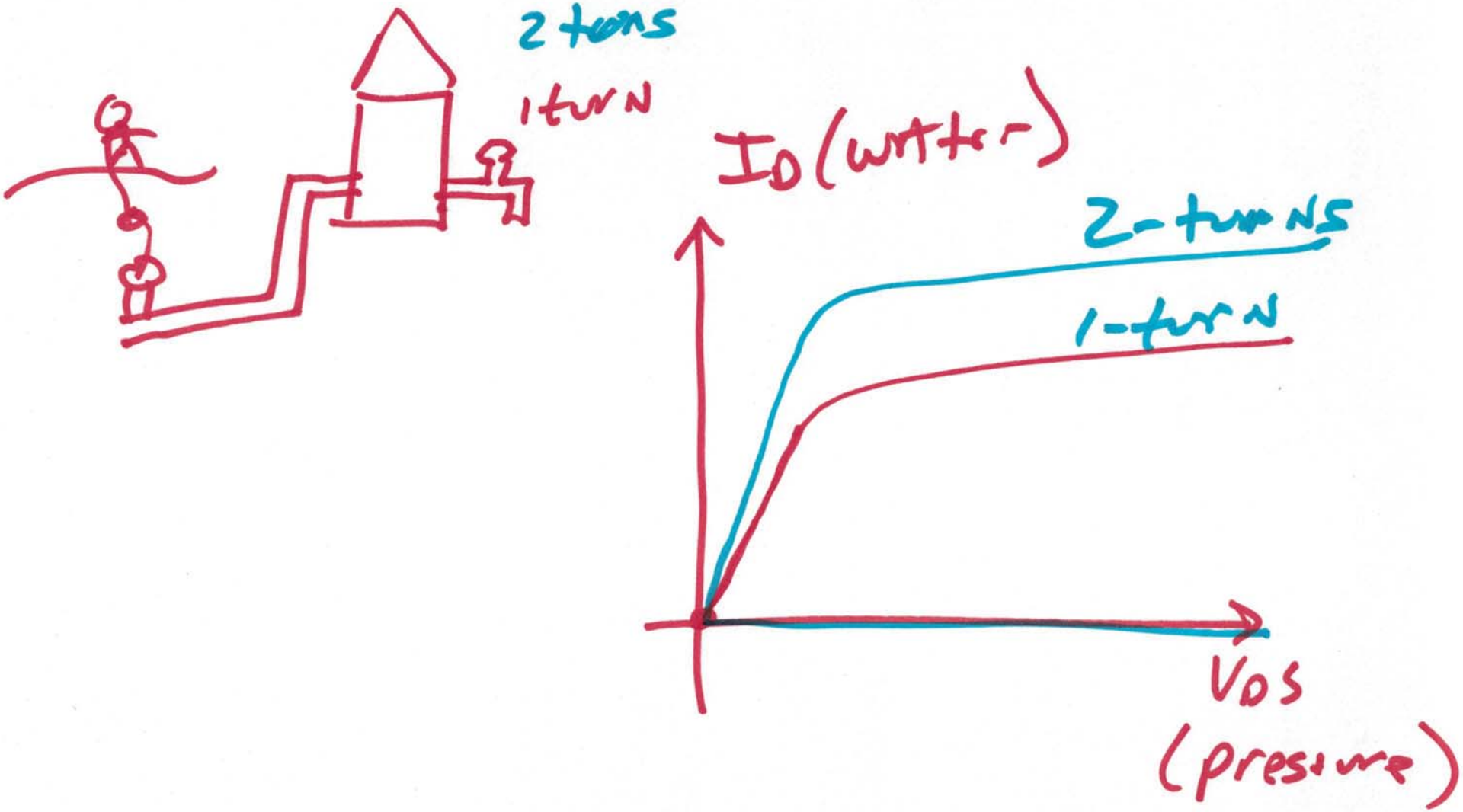
$$0.4 \times 2 = .8$$

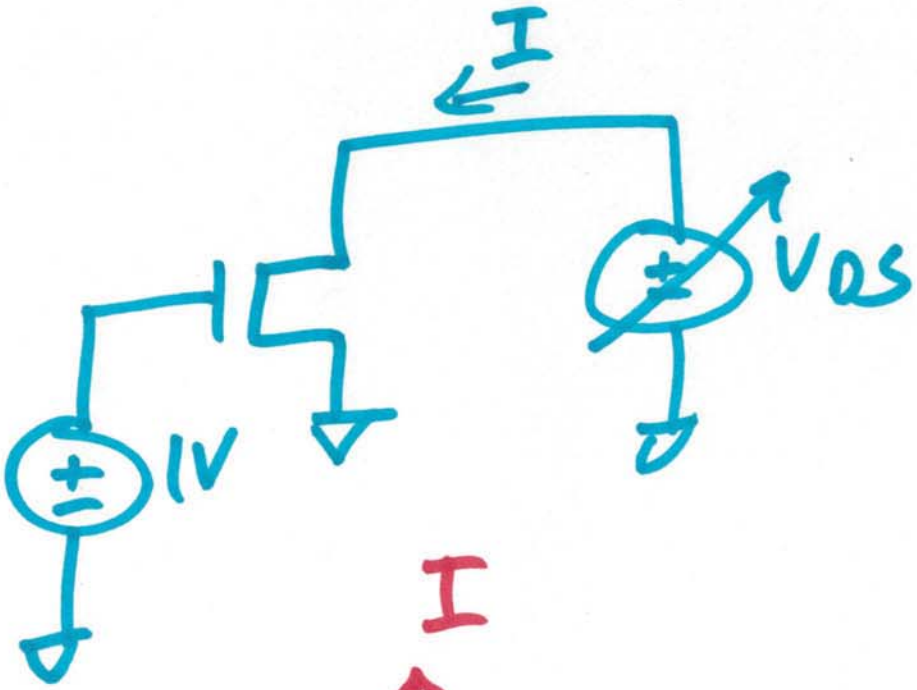
$$I_D = 40\mu$$

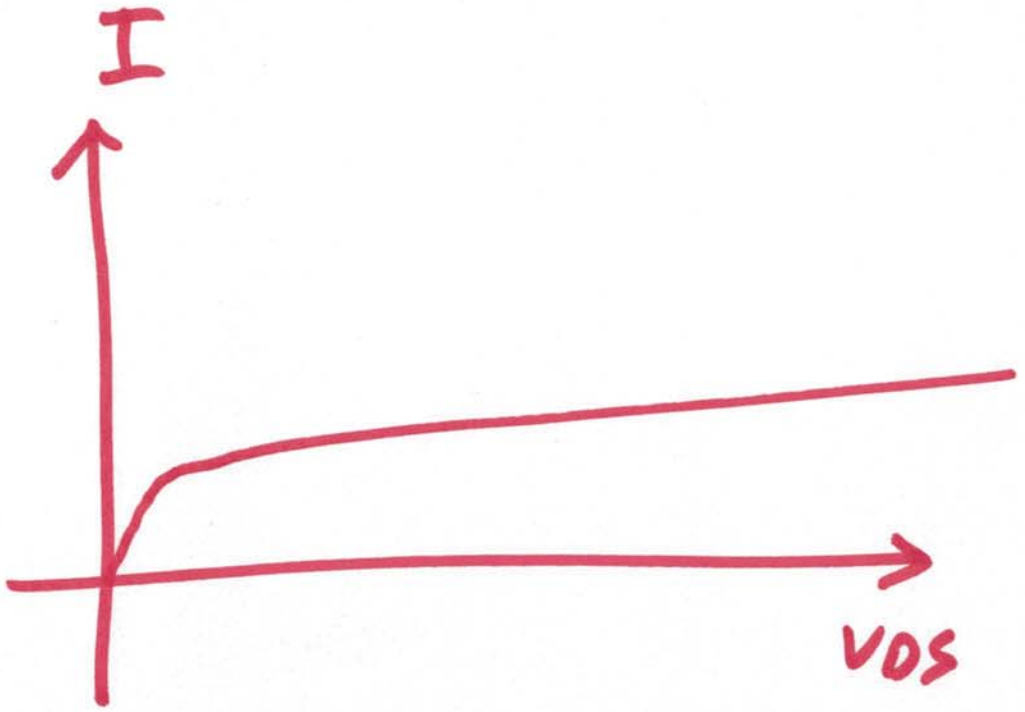


$$\frac{5 - V_X}{10K} = \frac{KP}{2} \frac{W}{L} (V_{GS} - V_{TH})^2$$

V_X


2 tons
1 turn
I_D (water)
2-turns
1-turn
V_{DS}
(pressure)


I
VDS
1V


I
VDS