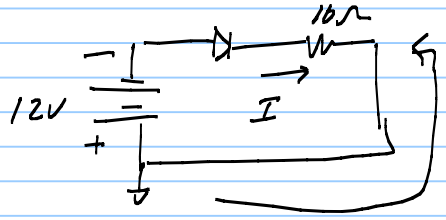
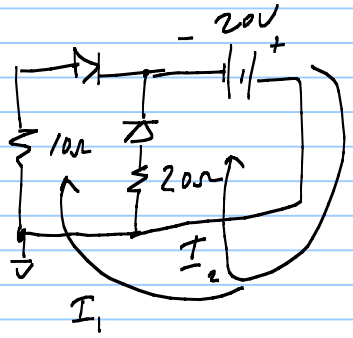
Week #2 Chpt 2 # 5, 8, 10, 11, 13, 21, 27, 29, 33, 35

Note Title 9/9/2012

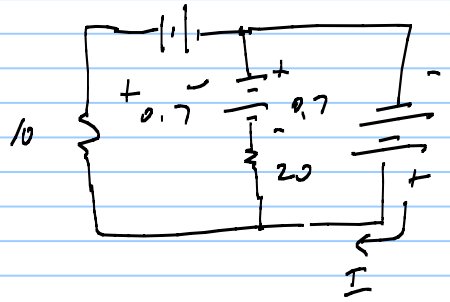
5) Determine the current I for each using the approx. diode model



current wants to flow CCW. Diode open $I = 0$



current wants to flow CW. Both diodes 0.7V

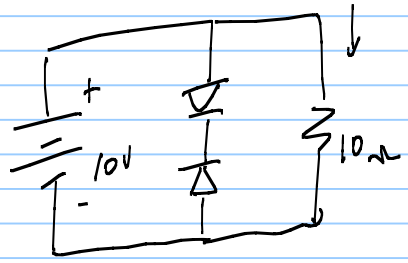


20V across each branch.

$I_{10\Omega} = \frac{20 - 0.7}{10\Omega} = 1.93A$

$I_{20\Omega} = \frac{20 - 0.7}{20} = .965A$

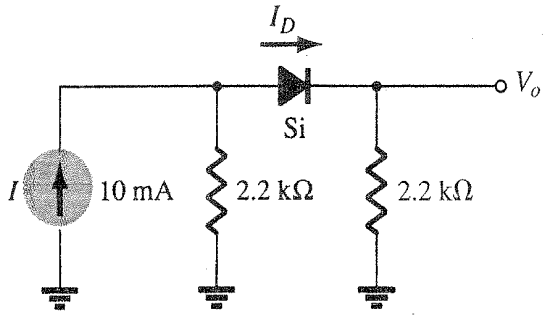
$I_{10} + I_{20} = I = 2.895A$



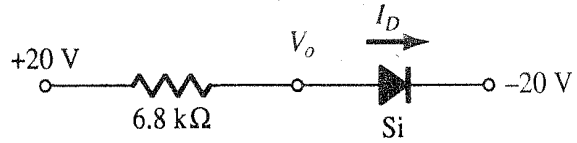
10V across both branches. Opposing diodes cannot be on simultaneously

$I = \frac{10V}{10\Omega} = 1A$

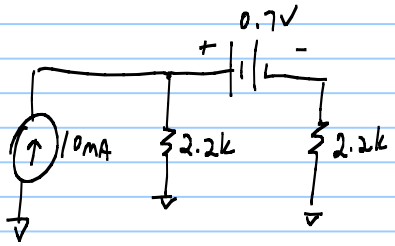
8) Determine I_D & V_o.



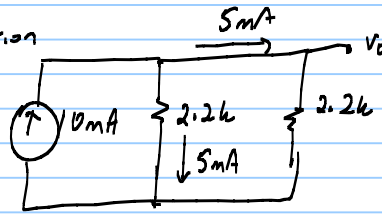
(a)



(b)



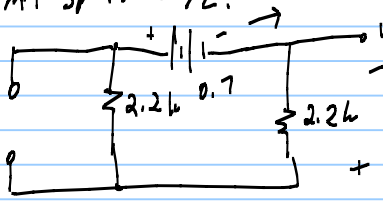
Superposition



$v_o = (5mA)(2.2k) = 11V$

$I_D = 5mA$

10mA splits in ½.



$\frac{0.7}{2} = 0.35V = v_o$

$I_D = \frac{-0.7V}{2(2.2k)} = -0.159mA$

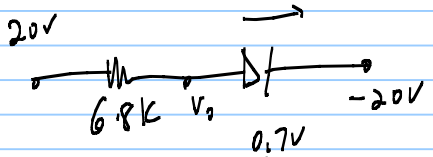
add

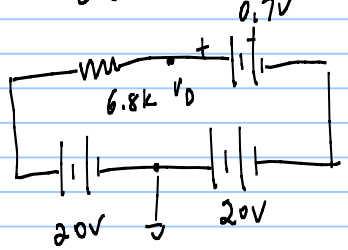
add

$I_D = 5mA - 0.159mA = 4.84mA$

$V_o = 11V - 0.35 = 10.65V$

b

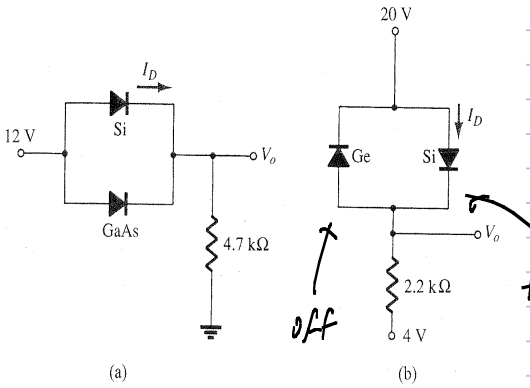




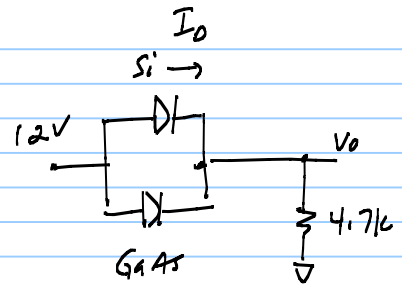
$I_D = \frac{40 - 0.7}{6.8k} = 5.78mA$

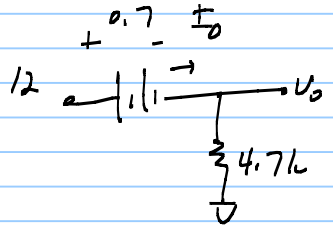
$V_D = -20 + 0.7 = -19.3V$

10)



a)





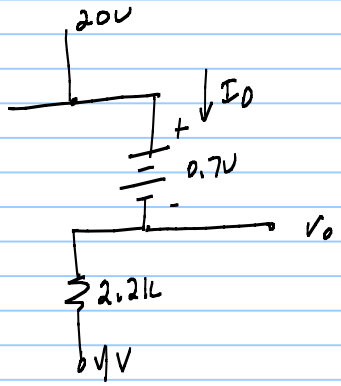
Si has lowest turn on voltage @ 0.7

$V_o = 12 - 0.7 = 11.3V$

Find current using resistor.

$11.3V / 4.7k = 2.4mA$

b)



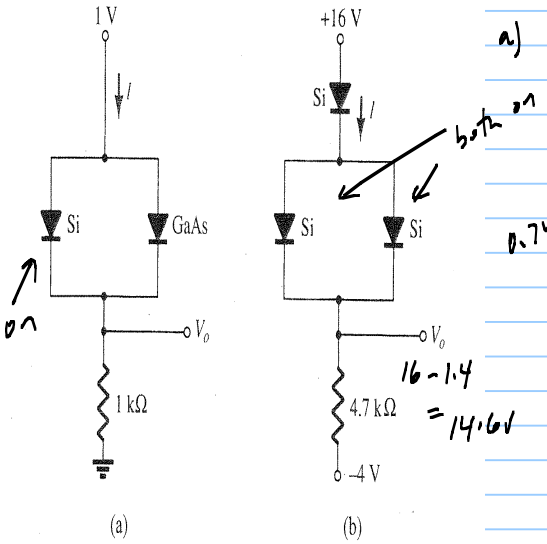
$V_o = 20 - 0.7 = 19.3V$

$I_D = \frac{19.3 - 4}{2.2k} = 6.95\,mA$

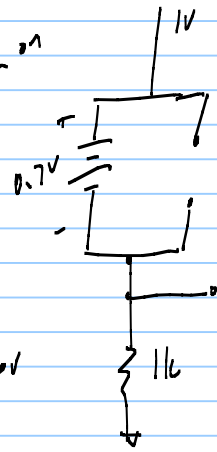
10.5 I_D

11)

Si turns on before others.



a)

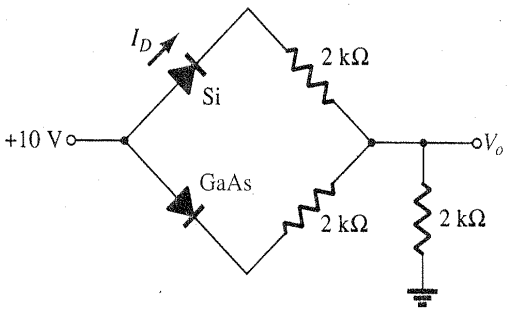


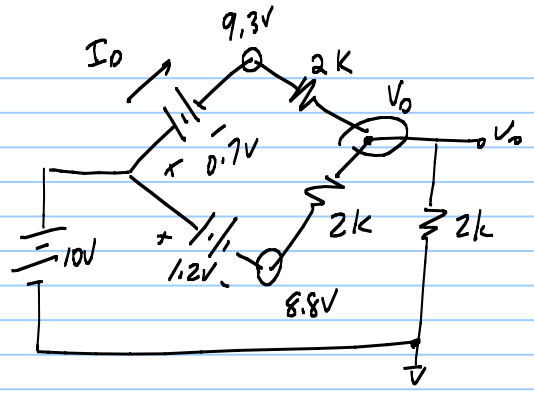
$V_o = 1V - 0.7 = 0.3V$

$I = \frac{0.3V}{1k} = 300\,\mu A$

b) $I = \frac{14.6 + 4}{4.7k} = 3.96mA$

13)





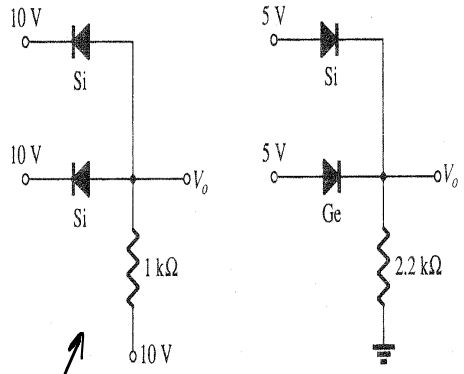
KCL @ V_o node. $\frac{9.3 - V_o}{2k} + \frac{8.8 - V_o}{2k} = \frac{V_o}{2k}$ $\quad 9.3 - V_o + 8.8 - V_o = V_o$

$18.1 = 3V_o$

$\boxed{V_o = 6.033V}$

$I_D = \frac{9.3 - V_o}{2k} = \frac{9.3 - 6.033}{2k} = \boxed{1.64\ mA = I_D}$

21)

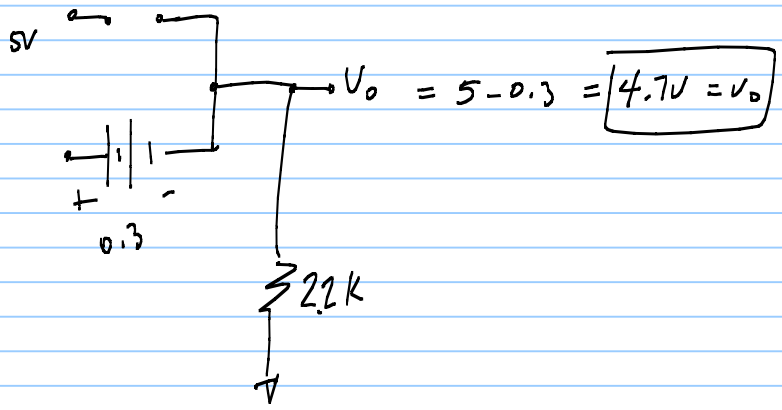


no voltage difference

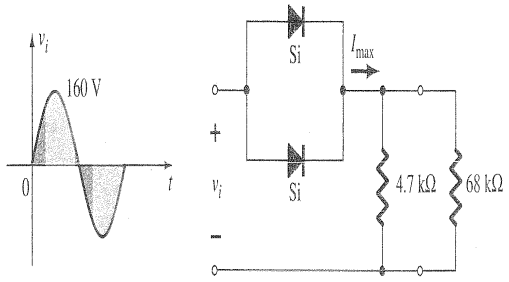
both end 10V. No current.

$\boxed{V_o = 10V}$

↙ Si cannot turn on.



27]



a) Given $P_{MAX} = 14mW$ for each diode determine the maximum current rating of each diode ($V_d = 0.7V$)

b) Determine I_{max} for parallel diodes

c) Determine the current through each diode at $V_{i\,max}$.

d) If only one diode were present, which would be the expected result.

a) $I_{D_{max}} = \frac{P_{D_{MAX}}}{0.7V} = 20mA$

b) $I_{max} = 2\,I_{D_{max}} = 40mA$

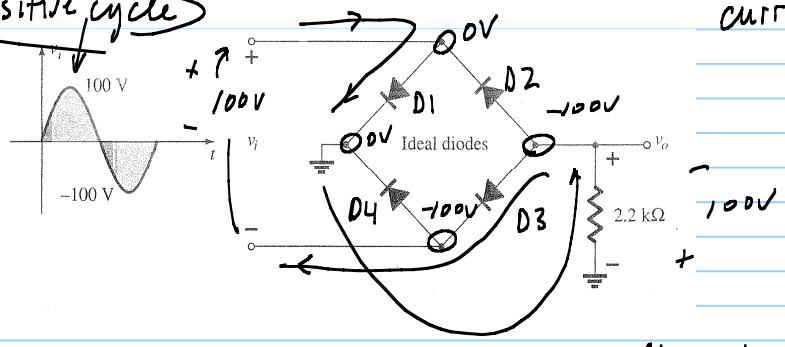
c) $I = \frac{160 - 0.7}{4.7\,//\,68k} = \frac{159.3V}{4.396k\Omega} = 36.236mA$

$I_d = I/2 = 18.1mA$

d) The current rating would be exceeded & the smoke would be let out.

29| Determine v_o and the required PIV rating of each diode. In addition, determine the maximum current through each diode.

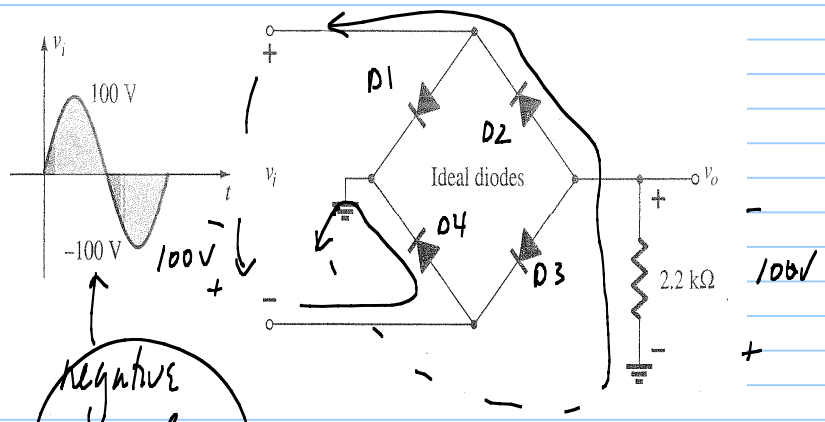
positive cycle



$v_o = -100V$

Diodes that are off must withstand a reverse voltage of 100V. So the minimum PIV rating is 100V. (D2 & D4 reverse biased)

The peak current is $\frac{100V}{2.2k} = 45.46mA$, in D1 & D3

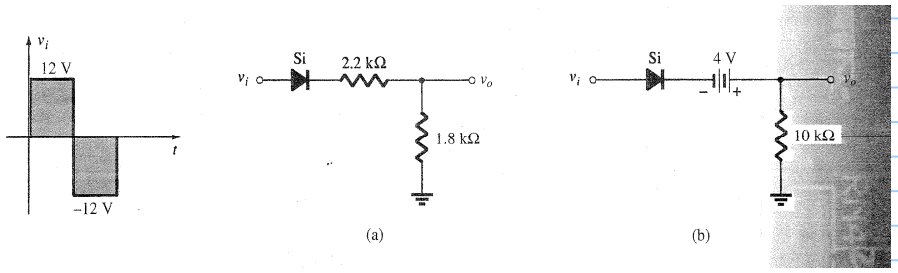


negative cycle

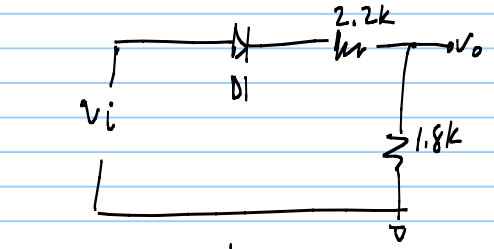
Current again @ output peaks at -100V.

This time D2 & D4 conduct. D1 & D3 are reverse biased.

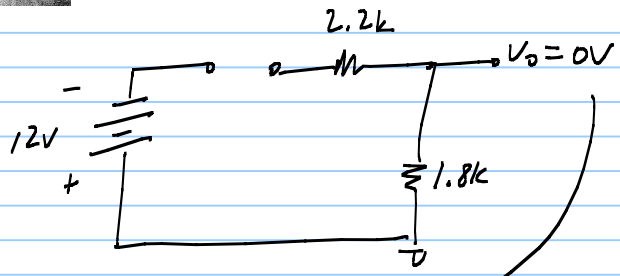
33) Determine V_o for each circuit.



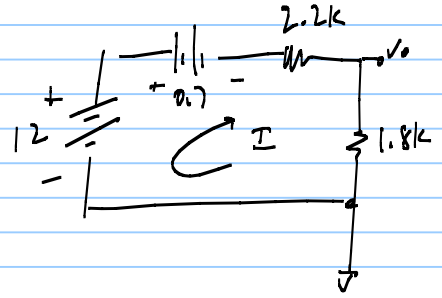
a)



−12V, DIODE OFF



+12V, DIODE ON

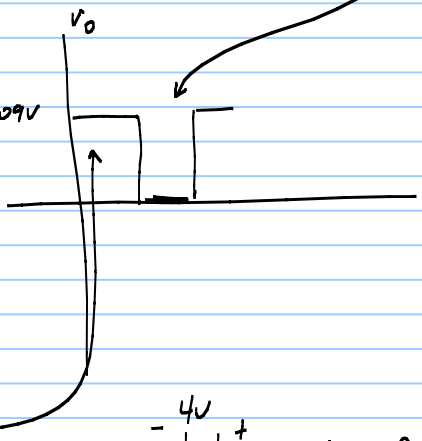


$12V - 0.7V - 2.2kI - 1.8kI = 0$

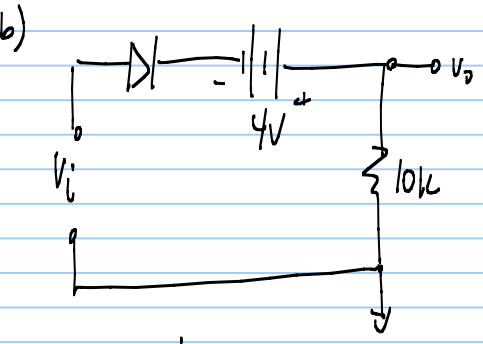
$11.3V = 4I$

$I = 2.825mA$

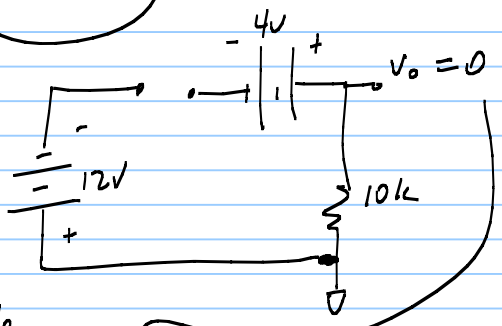
$V_o = (1.8k)(2.825mA) = 5.09V$



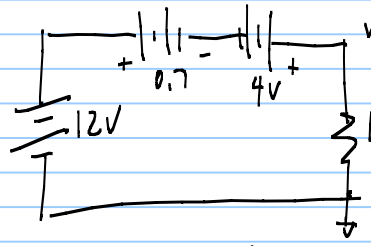
b)

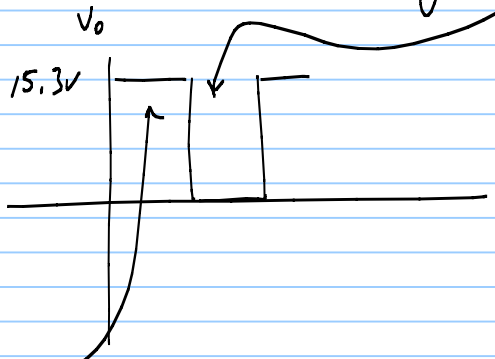


−12V, diode off



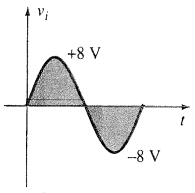
12V, diode on

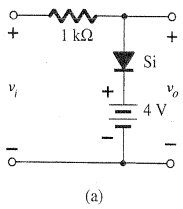




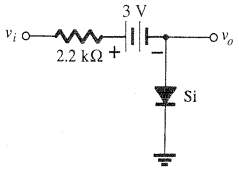
$V_o = 12 - 0.7 + 4 = 15.3V$

35





(a)



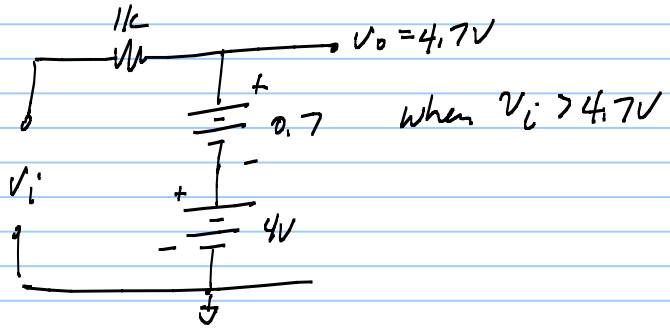
(b)

a) $v_i - v_d - 4 = 0$

$v_i - 4 = v_d$ $\quad v_d > 0.7$ on

so $v_i - 4 > 0.7$

& $v_i > 4.7V$ diode on.



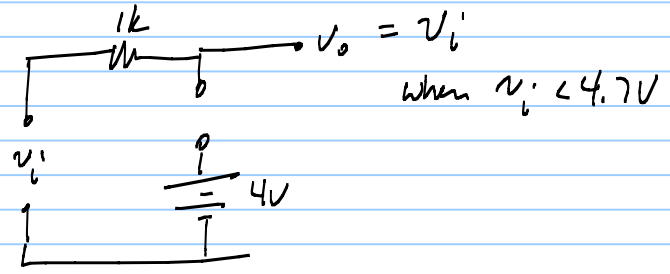
when $v_i > 4.7V$

$v_i - v_d - 4 = 0$

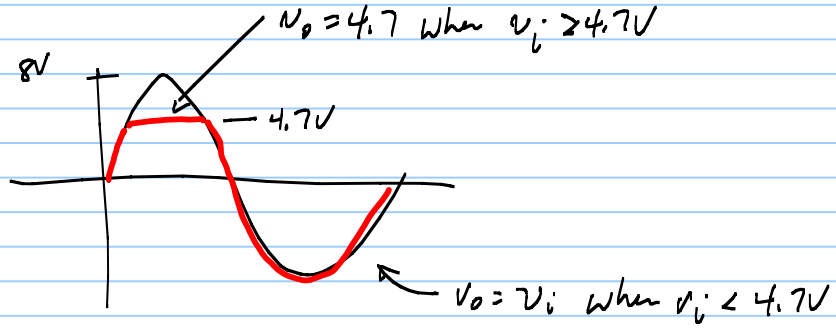
$v_d < 0.7$ off

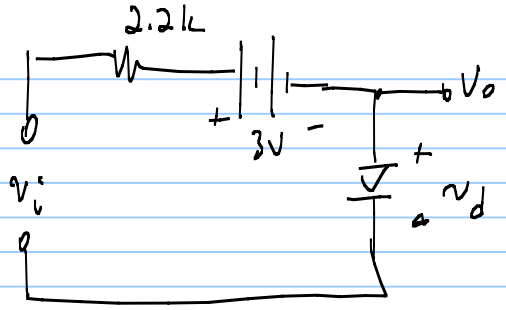
so $v_i - 4 < 0.7$

& $v_i < 4.7$ diode off



when $v_i < 4.7V$





a) $v_i - 3 - V_d = 0$

$v_i - 3 = V_d$ $\quad V_d > 0.7$ on

so $v_i - 3 > 0.7$

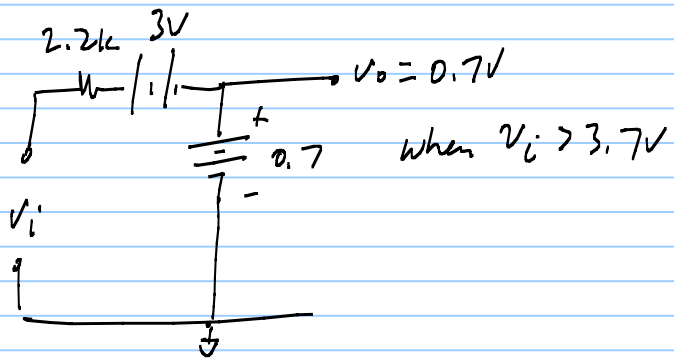
& $v_i > 3.7V$ diode on.

$v_i - 3 - V_d = 0$

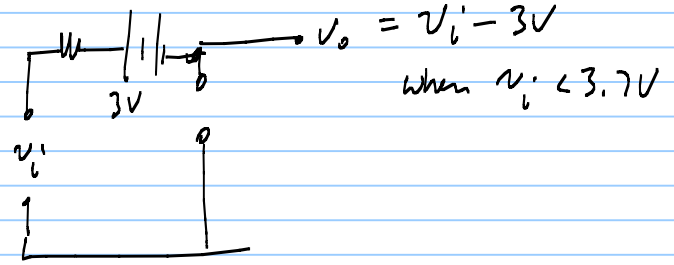
$V_d < 0.7$ off

so $v_i - 3 < 0.7$

& $v_i < 3.7$ diode off



when $v_i > 3.7V$



when $v_i < 3.7V$