Homework #1 Solutions:

4.2 Refer to Fig. P4.2.

(a) Diode is conducting, thus

$V = -3$ V

$$I = \frac{+3 - (-3)}{10\ \text{k}\Omega} = 0.6\ \text{mA}$$

(b) Diode is reverse biased, thus

$I = 0$

$V = +3$ V

(c) Diode is conducting, thus

$V = +3$ V

$$I = \frac{+3 - (-3)}{10\ \text{k}\Omega} = 0.6\ \text{mA}$$

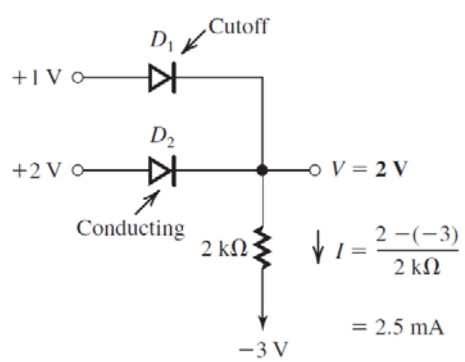
(d) Diode is reverse biased, thus

$I = 0$

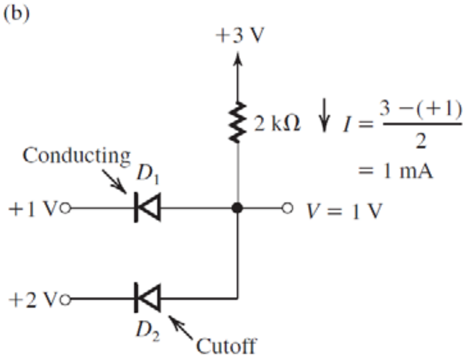
$V = -3$ V

4.3

(a)



(b)



4.6

A	B	X	Y
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	1

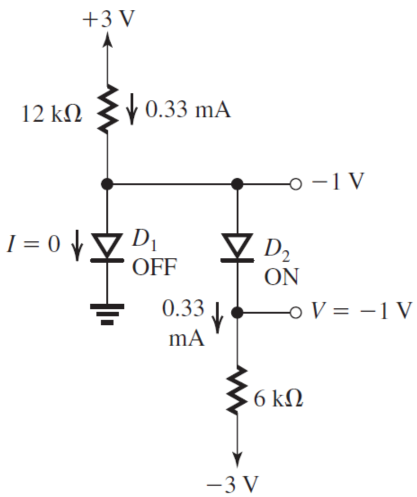
$X = AB, \quad Y = A + B$

X and Y are the same for

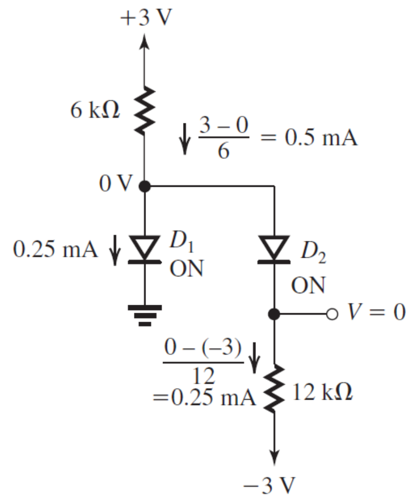
$A = B$

X and Y are opposite if $A \neq B$

4.9



(a)



(b)

(a) If we assume that both D_1 and D_2 are conducting, then $V = 0$ V and the current in D_2 will be $[0 - (-3)]/6 = 0.5$ mA. The current in the 12 kΩ will be $(3 - 0)/12 = 0.25$ mA. A node equation at the common anodes node yields a negative current in D_1. It follows that our assumption is wrong and D_1 must be off. Now making the assumption that D_1 is off and D_2 is on, we obtain the results shown in Fig. (a):

$I = 0$

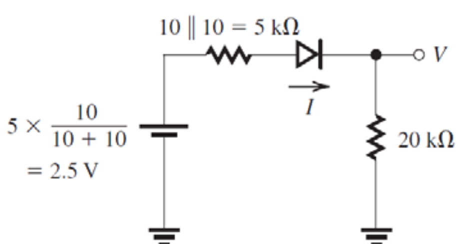
$V = -1$ V

(b) In (b), the two resistors are interchanged. With some reasoning, we can see that the current supplied through the 6-kΩ resistor will exceed that drawn through the 12-kΩ resistor, leaving sufficient current to keep D_1 conducting. Assuming that D_1 and D_2 are both conducting gives the results shown in Fig. (b):

$I = 0.25$ mA

$V = 0$ V

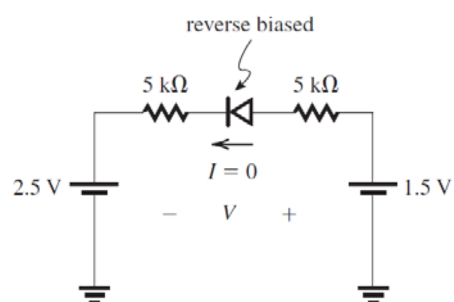
4.10:



$$I = \frac{2.5}{5 + 20} = 0.1 \text{ mA}$$

$$V = 0.1 \times 20 = 2 \text{ V}$$

(a)



$$V = 1.5 - 2.5 = -1 \text{ V}$$

(b)