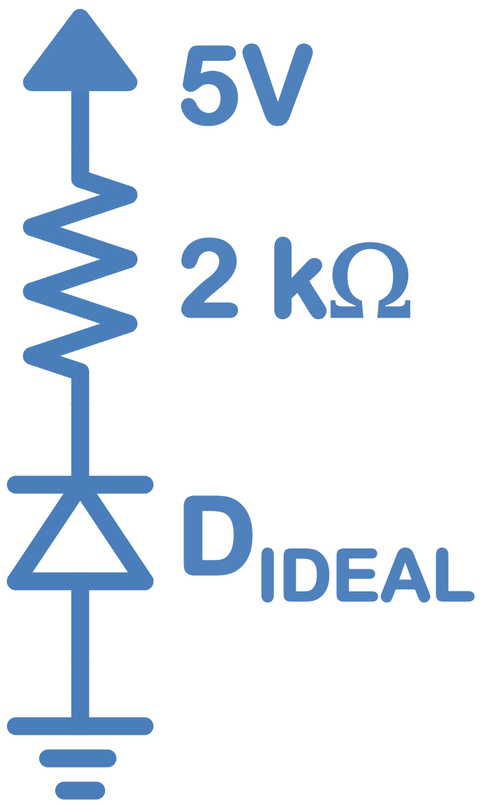
Problem 1.

Find V_D and I_D for each circuit.

(A)

1. FB:
2. short (vD=0)
3. iD = 3.3/3.8k
 iD = 0.87mA
4. check iD>0
YES
5. Done



(B)

1. RB:
2. open (iD=0)
3. vD = 0-5 = -5V
4. check vD<0.7
YES
5. Done

(C)

1. RB:
2. open (iD=0)
3. vD = -1-0 = -1V
4. check vD<0.7
YES
5. Done

(D)

1. FB:
2. CVD (vD=0.7)
3. iD = 2.3/7k
 iD = 0.33mA
4. check iD>0
YES
5. Done

Problem 1.
Find V_D and I_D for each circuit.

(E)

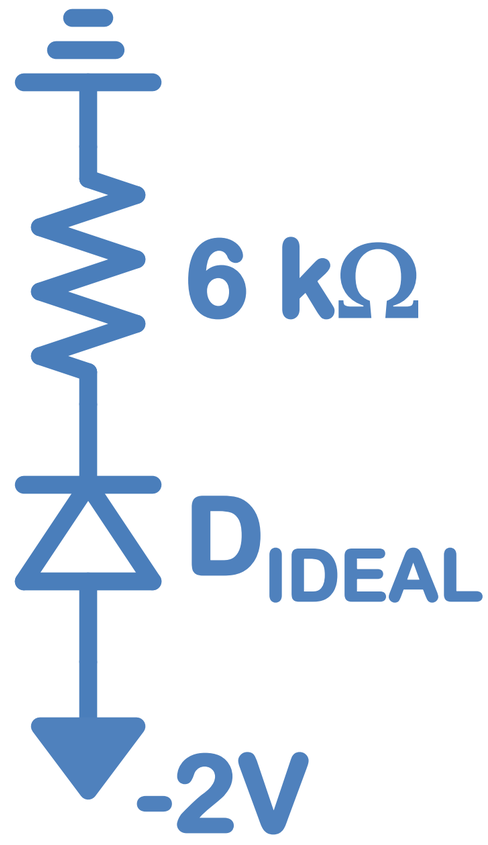
1. FB:
2. CVD (vD=0.7)
3. iD = 7.3/12k
   iD = 0.61mA
4. check iD>0
   YES
5. Done

(F)

1. FB:
2. CVD (vD=0.7)
3. iD = 3.3/2.3k
   iD = 1.43mA
4. check iD>0
   YES
5. Done

(G)

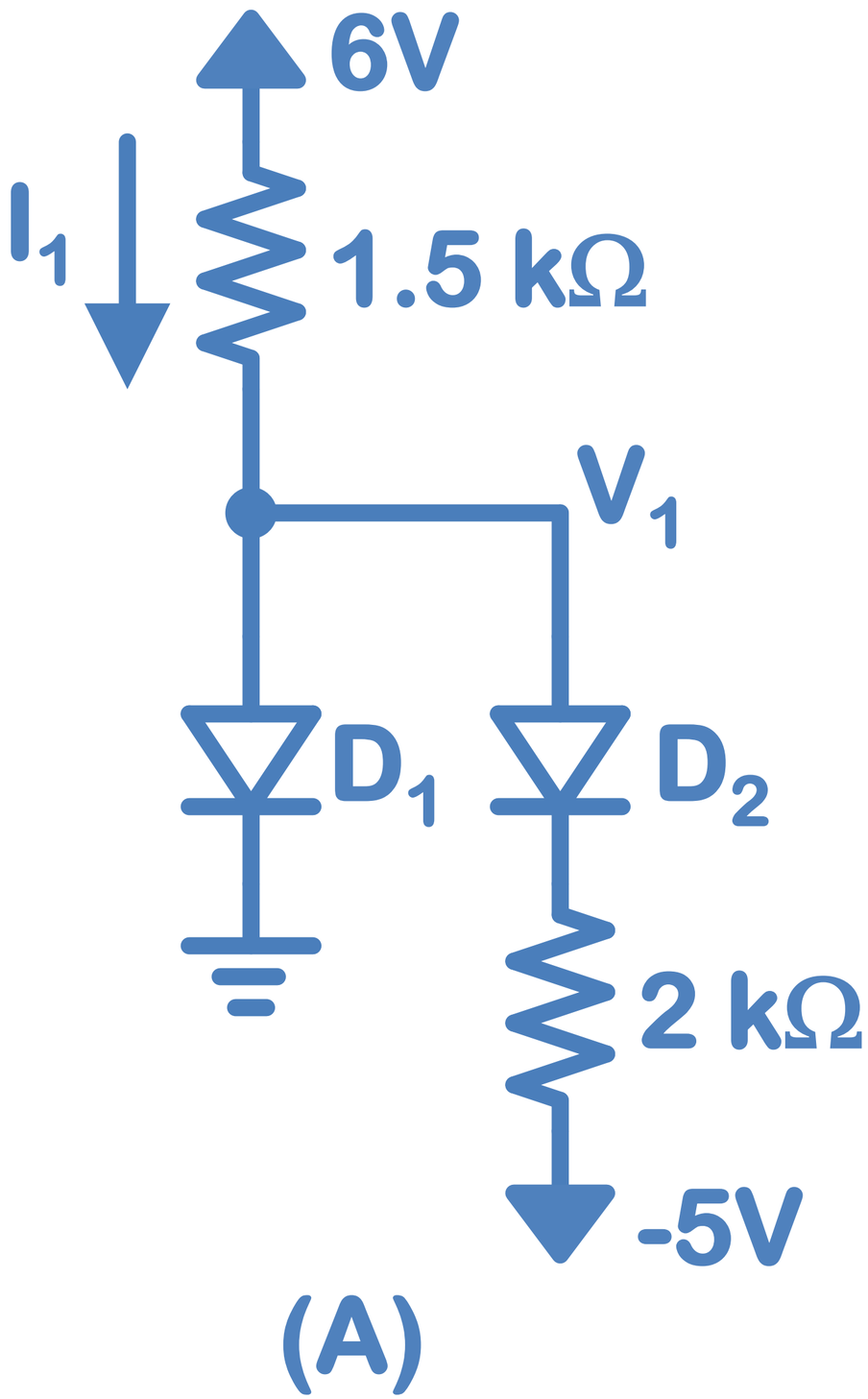
1. FB:
2. CVD (vD=0.7)
3. iD = 4.3/11k
   iD = 0.39mA
4. check iD>0
   YES
5. Done



(H)

1. RB:
2. open (iD=0)
3. vD = -2-0 = -2V
4. check vD<0.7
   YES
5. Done

Problem 2. Find $V_{1,2,3}$ and $I_{1,2,3}$ in the circuits below. All diodes are ideal.



(A)

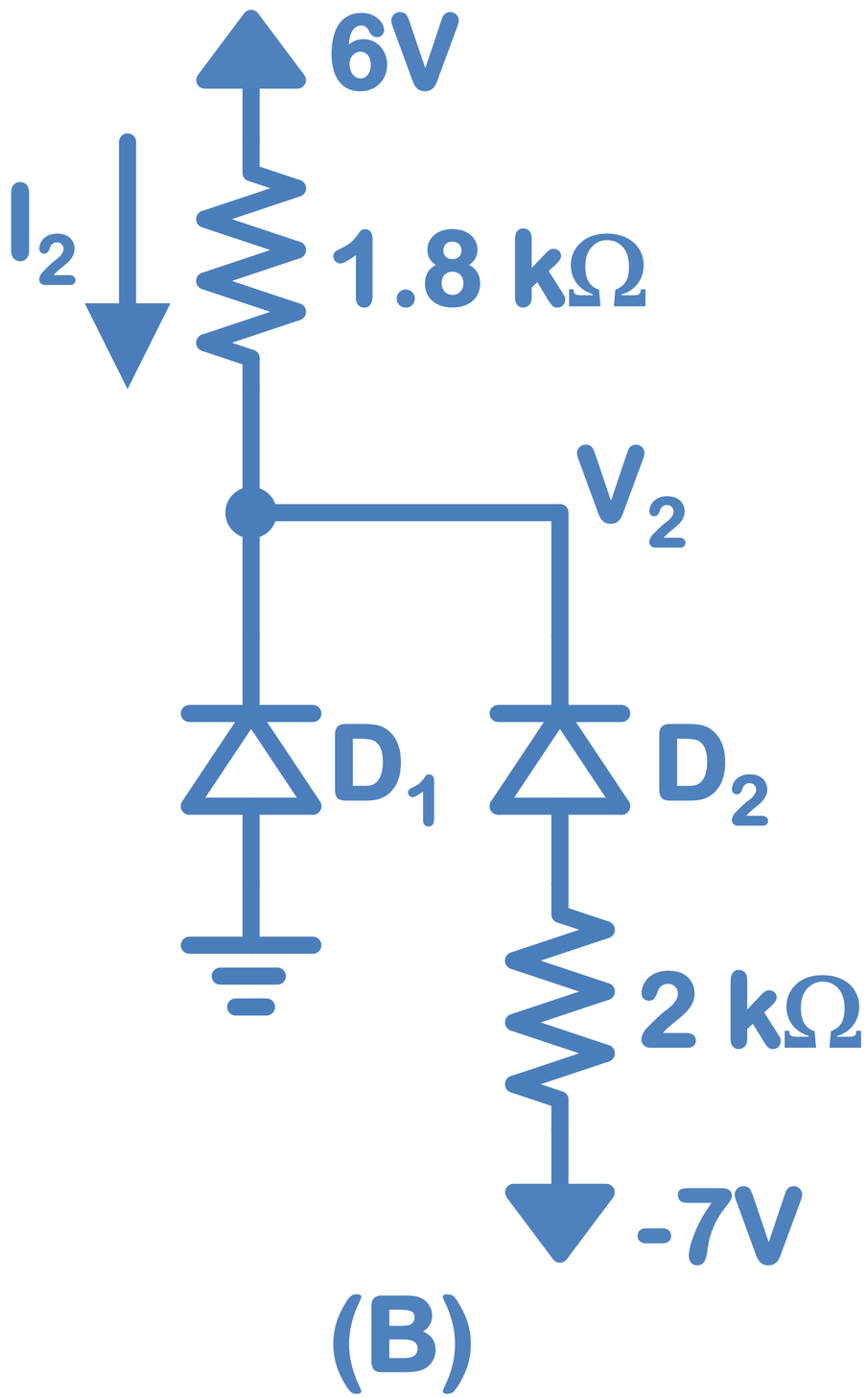
1. FB, FB
2. CVD (vD1=0.7, vD2=0.7)
3. Find I1, V1, iD1, iD2

V1 = 0.7
I1 = 5.3/1.5k = 3.53mA
iD2 = 0- -5/2k = 2.5mA
iD1 = 3.53-2.5 = 1.03mA

4. check
iD1>0 Yes
iD2>0 Yes

5. Done

Problem 2. Find $V_{1,2,3}$ and $I_{1,2,3}$ in the circuits below. All diodes are ideal.



(B)

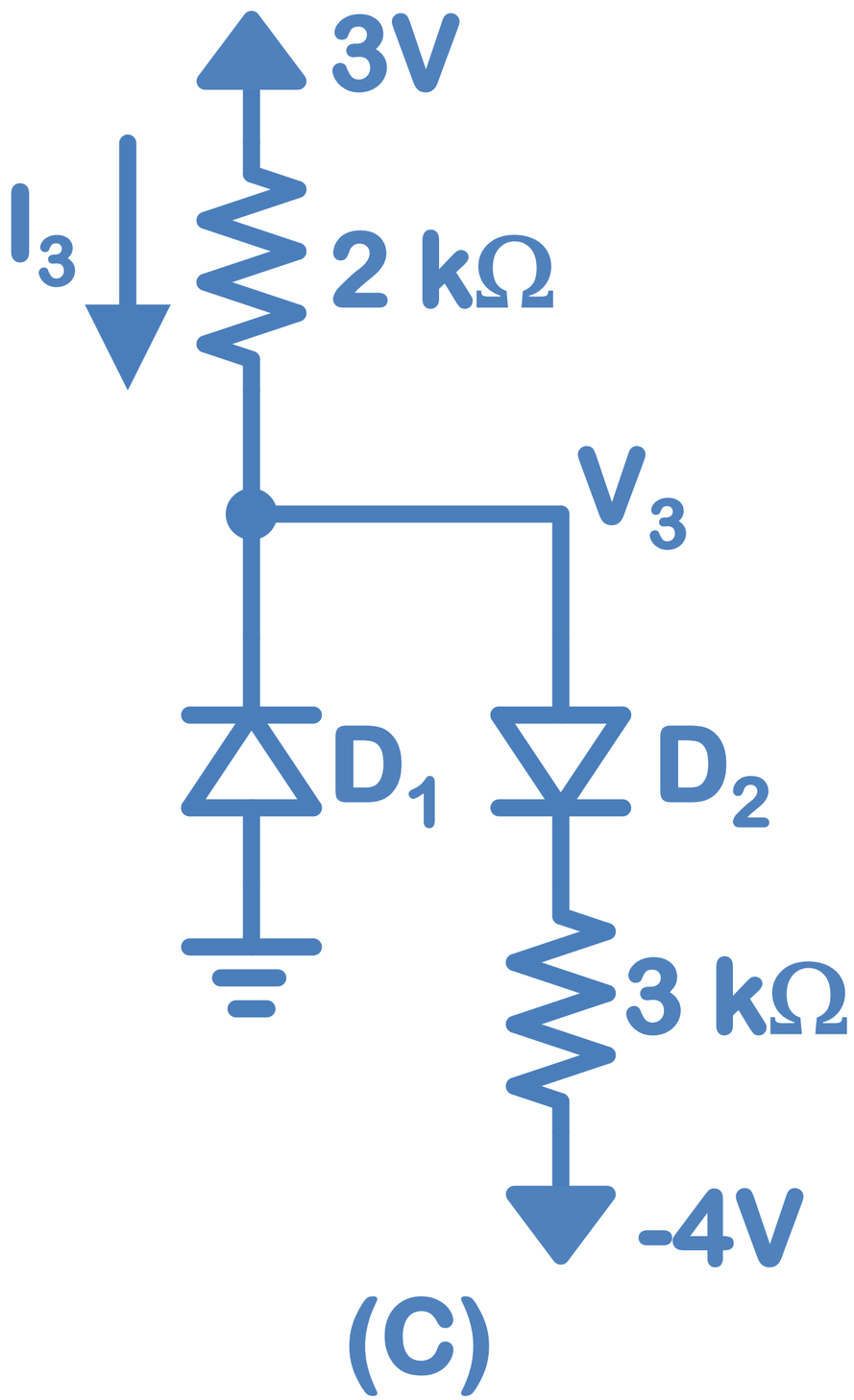
1. RB, RB
2. opens (iD1=0, iD2=0)
3. Find I2, V2, vD1, vD2

V2 = 6
I2 = 0
vD1 = 0- 6 = -6V
vD2 = -7 -6 = -13V

4. check
vD1<0.7 Yes
vD2<0.7 Yes

5. Done

Problem 2. Find $V_{1,2,3}$ and $I_{1,2,3}$ in the circuits below. All diodes are ideal.



(C)

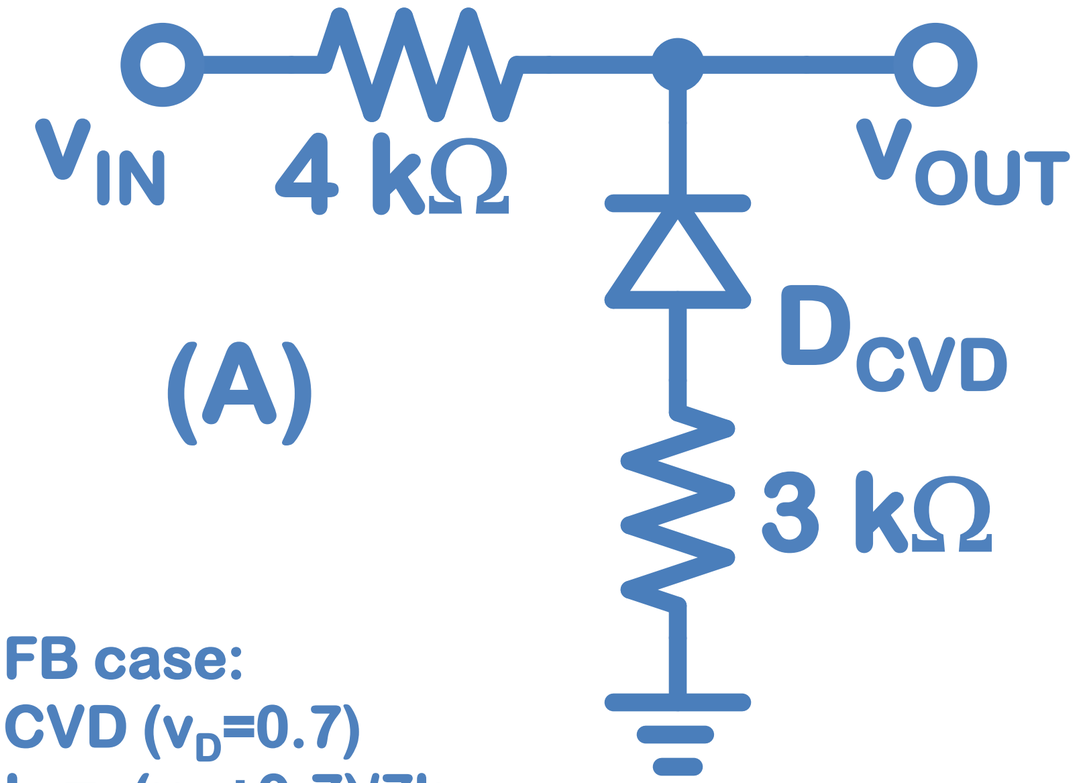
1. RB, FB
2. open, CVD (iD1=0, vD2=0.7)
3. Find I3, V3, iD1, iD2

I3 = (3- -4 – 0.7)/(2k + 3k) = 6.3/5k = 1.26mA
V3 = 3-2k*1.26m = 0.48V
vD1 = 0- 0.48 = -0.48V
iD2 = I3 = 1.26mA

4. check
vD1<0.7 Yes
iD2>0 Yes

5. Done

Problem 3. Find the equations and plot $v_{OUT}(v_{IN})$ for each circuit.

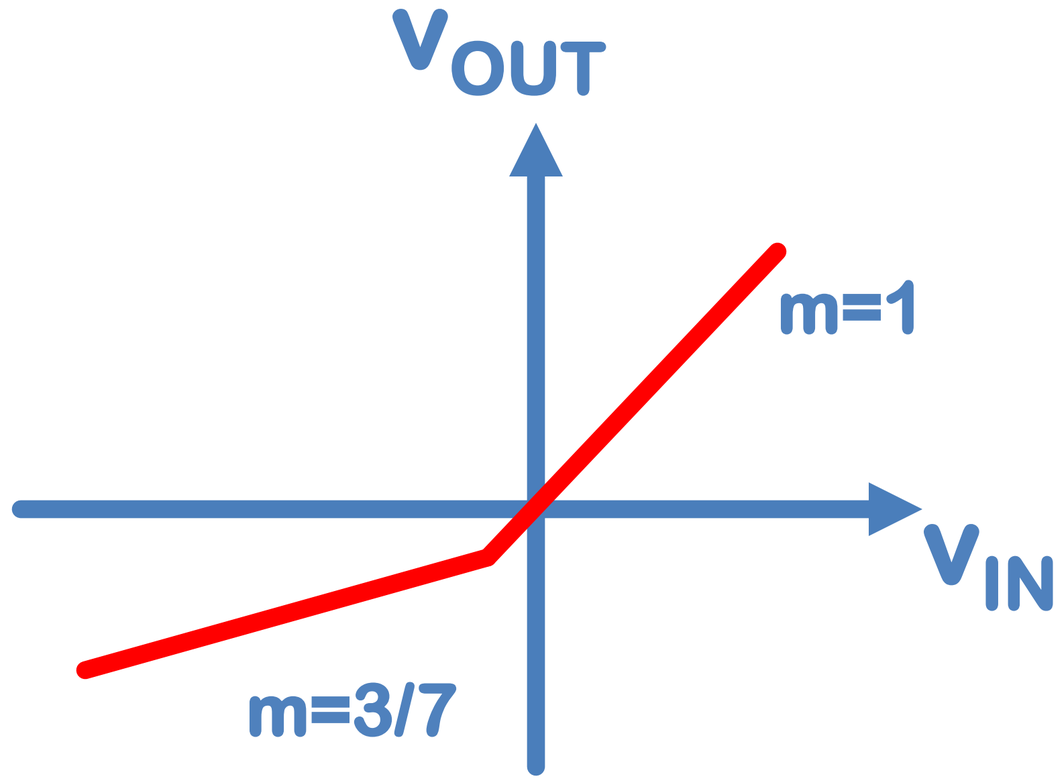


(A)

1. FB case:
2. CVD (v_D=0.7)
3. $I_D = -(v_{IN}+0.7)/7k$
$v_{OUT} = -0.7-3kI_D$
$v_{OUT} = -0.7+(3/7)(v_{IN}+0.7)$
$v_{OUT}=(3/7)v_{IN}-(7/7)0.7+(3/7)0.7$
vOUT=(3/7)vIN-.4

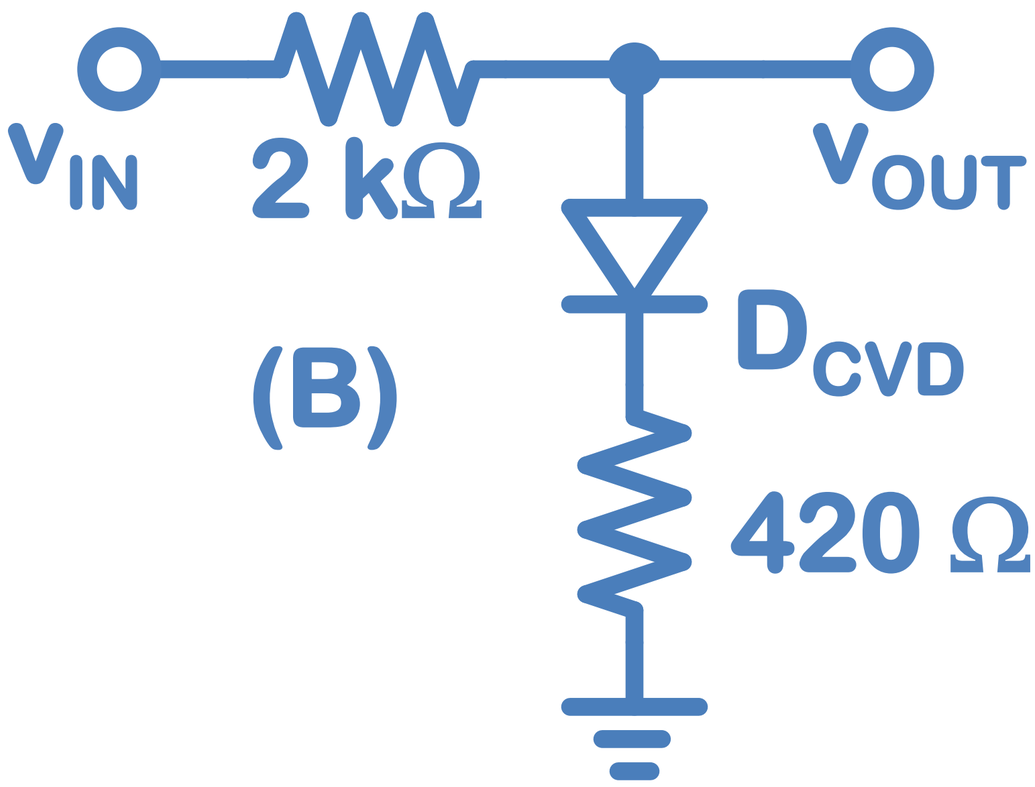
4. apply i_D>0, therefore
$-(v_{IN}+0.7)/7k > 0$
$v_{IN} < -0.7$
5. Next

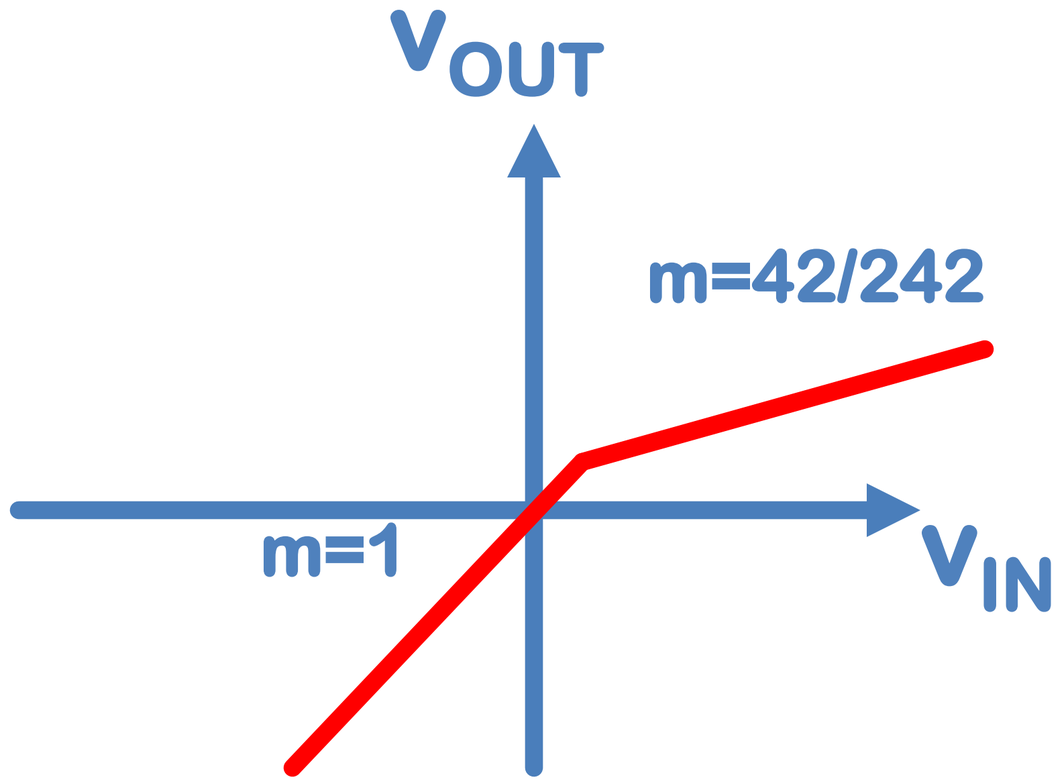
1. RB case:
2. open (i_D=0)
3. $v_{OUT}=v_{IN}$
$v_D = (0-v_{IN})$
4. apply v_D<0.7, therefore
-vIN < 0.7
$v_{IN} > -0.7$
5. Done



answer:
vOUT = (3/7)v_{IN}-0.4, v_{IN}< -0.7
vOUT = vIN, v_{IN} > -0.7

Problem 3. Find the equations and plot $v_{OUT}(v_{IN})$ for each circuit.



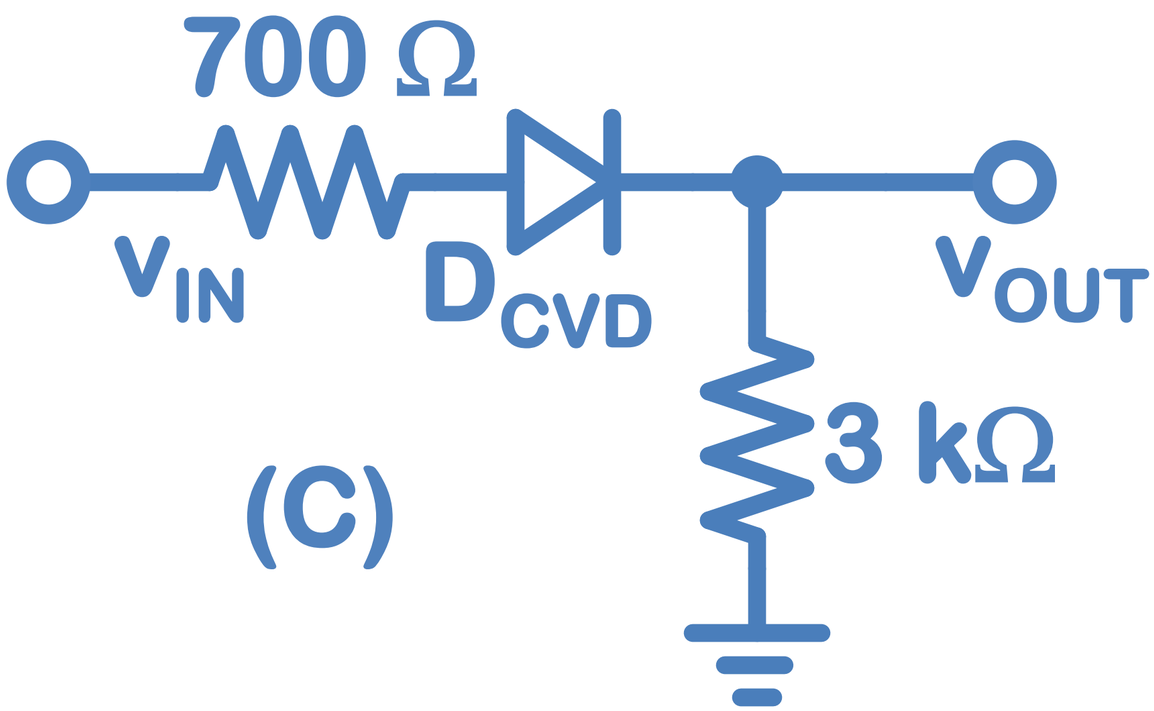


1. FB case:
2. CVD (v_D=0.7)
3. $i_D = (v_{IN}-0.7)/(2420))$
$v_{OUT}=0.7+(420/(420+2k))(v_{IN}-0.7)$
$v_{OUT} = (42/242)(v_{IN}-0.7) + 0.7$
4. apply $i_D>0$, therfore
$v_{IN} > 0.7$
5. Next

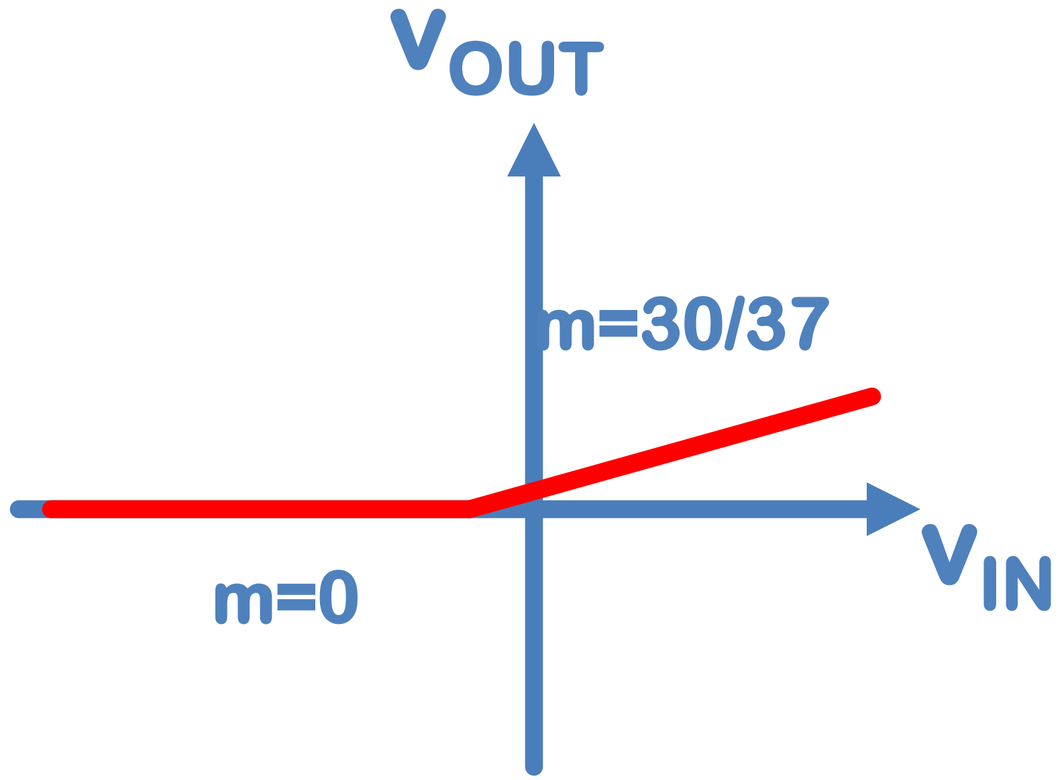
1. RB case:
2. open (iD=0)
3. $v_{OUT}=v_{IN}$
$v_D = (v_{IN}-0)$
4. apply $v_D<0.7$, therfore
$v_{IN} < 0.7$
5. Done

answer:
$v_{OUT} = (42/242)(v_{IN}-0.7)+0.7$, $v_{IN}>0.7$
$v_{OUT} = v_{IN}$, $v_{IN}<0.7$

Problem 3. Find the equations and plot $v_{OUT}(v_{IN})$ for each circuit.



(C)

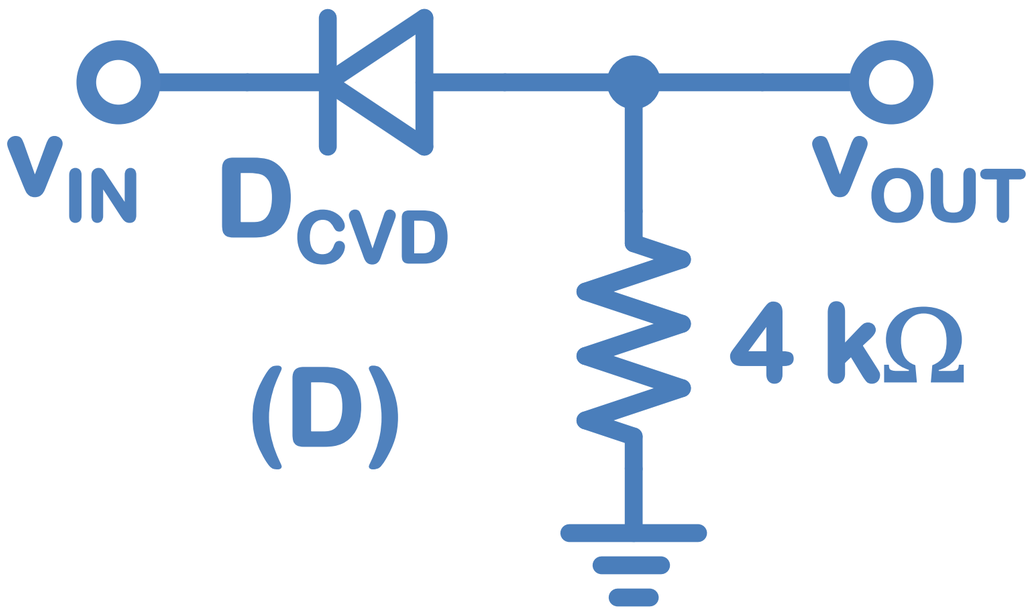


1. FB case:
2. CVD (v_D=0.7)
3. $i_D = (v_{IN}-0.7)/(3700))$
$v_{OUT}=3k*i_D=(30/37)(v_{IN}-0.7)$
4. apply iD>0, therfore
$v_{IN} > 0.7$
5. Next

1. RB case:
2. open (i_D=0)
3. v_{OUT}=0
$v_D = v_{IN}-v_{OUT}$
$v_D = v_{IN}-0$
4. apply v_D<0.7, therfore
$v_{IN} < 0.7$
5. Done

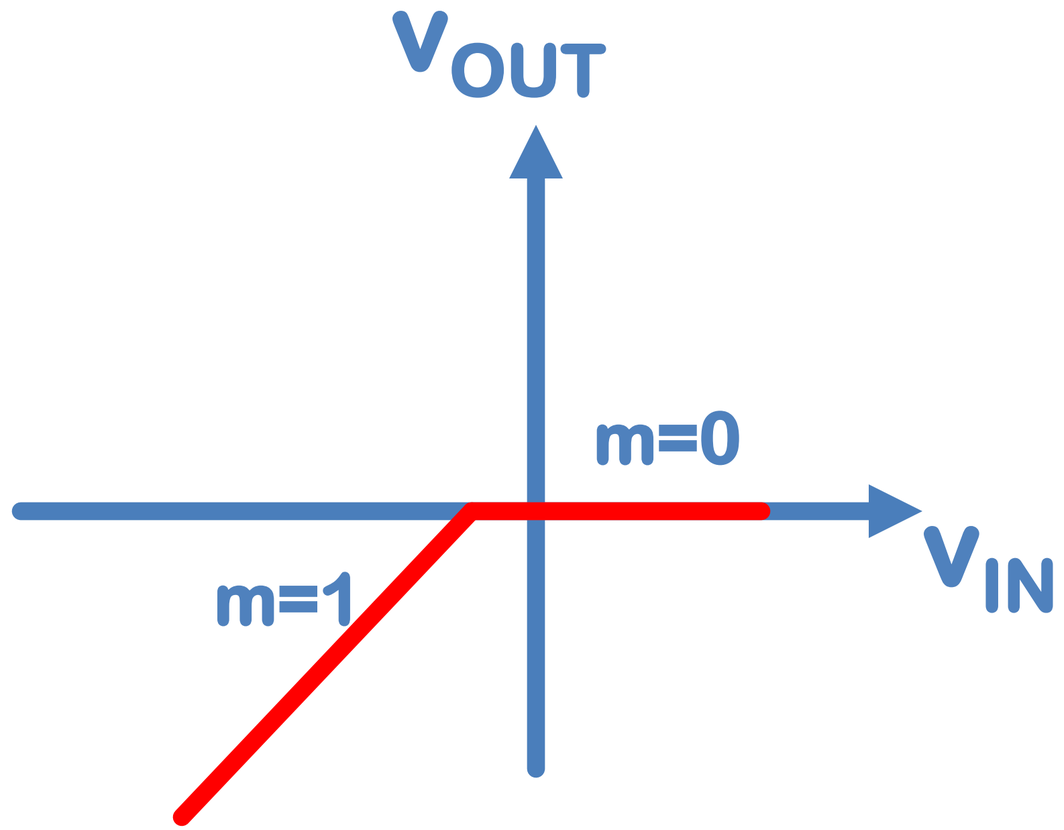
answer:
$v_{OUT} = (30/37)(v_{IN}-0.7)$, $v_{IN}>0.7$
$v_{OUT} = 0$, $v_{IN}<0.7$

Problem 3. Find the equations and plot $v_{OUT}(v_{IN})$ for each circuit.



1. FB case:
2. CVD (v_D=0.7)
3. $v_{OUT}=v_{IN}+0.7$
 $i_D = -(v_{IN}+0.7)/(4k)$
4. apply $i_D>0$, therfore
 $-(v_{IN}+0.7)/4k > 0$
 $v_{IN} < -0.7$
5. Next

1. RB case:
2. open (i_D=0)
3. $v_{OUT}=0$
 $v_D = v_{OUT}-v_{IN}$
 $v_D = -v_{IN}$
4. apply $v_D<0.7$, therfore
 $v_{IN} > -0.7$
5. Done



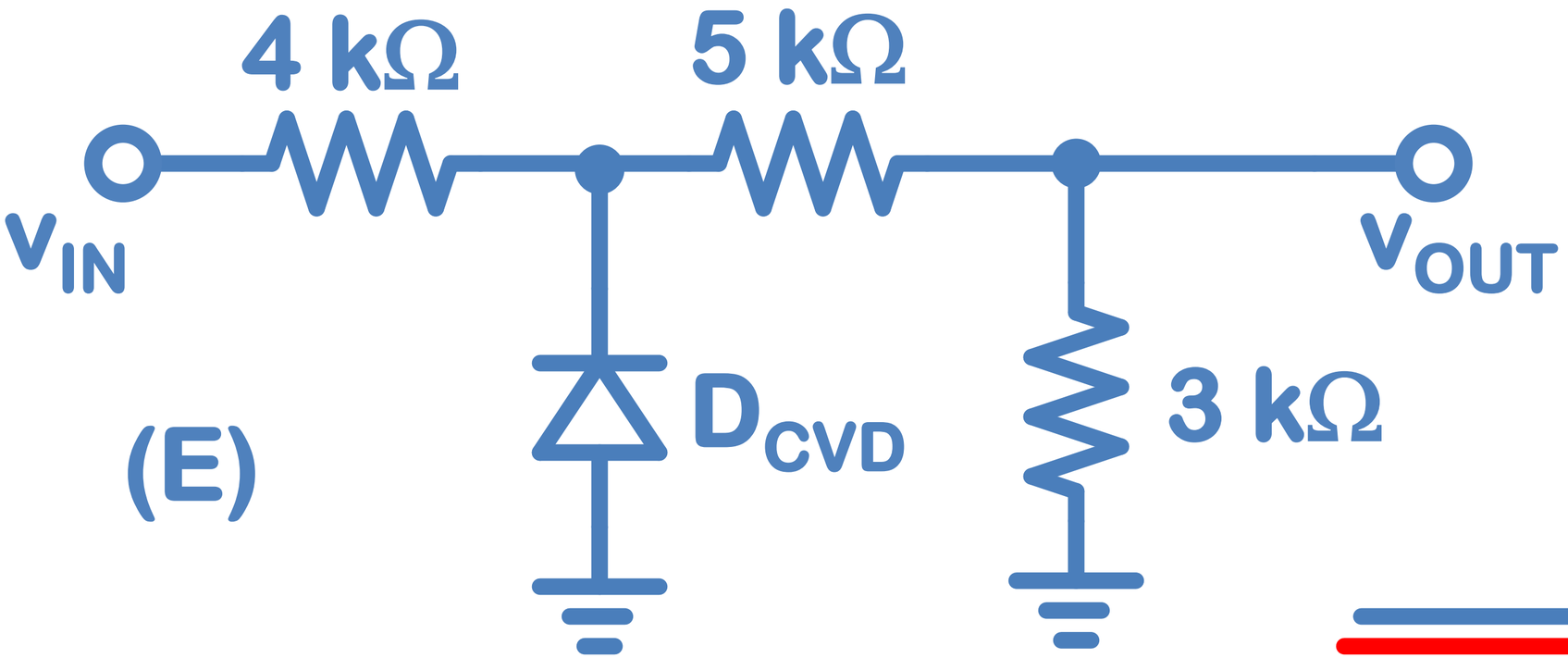
answer:

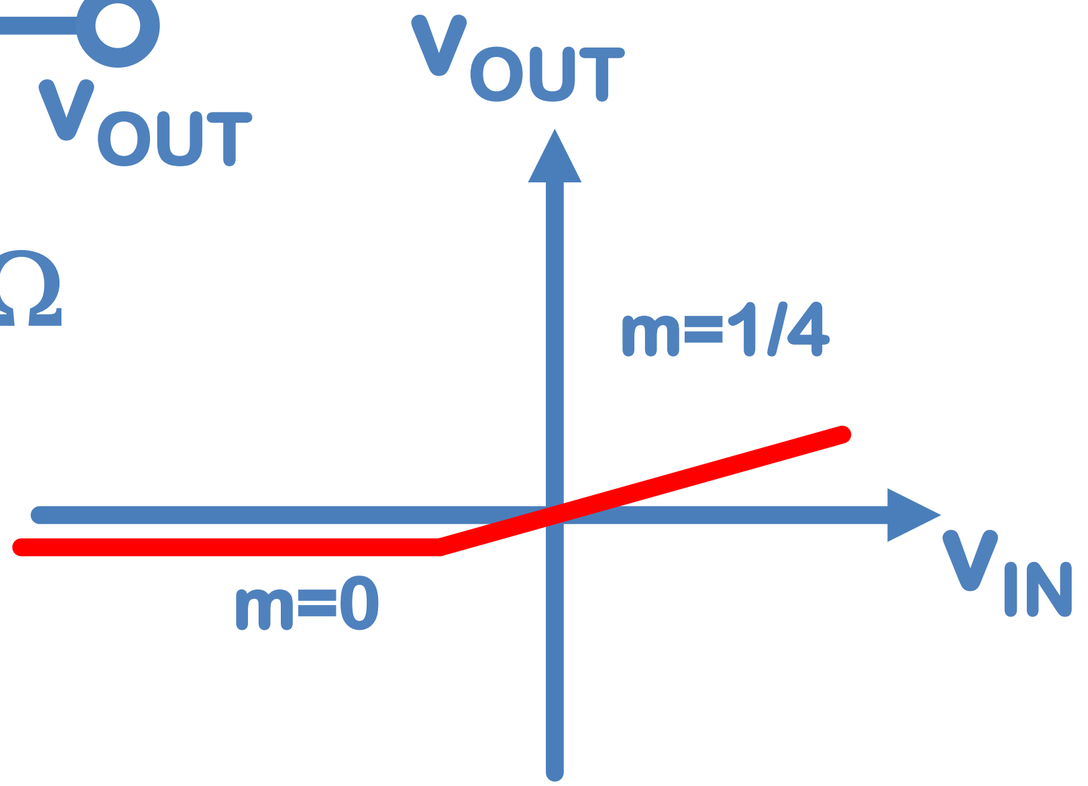
$v_{OUT} = v_{IN}+0.7$, $v_{IN}<-0.7$

$v_{OUT} = 0$, $v_{IN}>-0.7$

Problem 3.

a) Find the equation and plot $v_{OUT}(v_{IN})$ for each circuit.





1. FB case:
2. short (v_D=0.7)
3. v_{OUT}=-0.7(3/8)
   $i_D = (-0.7-v_{IN})/(4k)+-.7/8k$
4. apply $i_D>0$, therfore
   $(-0.7-v_{IN})/(4k)+-.7/8k > 0$
   $(-1.4-2v_{IN}) -.7 > 0$
   $-2v_{IN}>2.1$
   $v_{IN}<-1.05$
5. Next

1. RB case:
2. open (i_D=0)
3. $v_{OUT}=(3k/(4k+5k+3k))v_{IN}$
   $v_{OUT} = (1/4)v_{IN}$
   $v_D = 0-(8k/12k)v_{IN}$
   $v_D = 0-(2/3)v_{IN}$
4. apply $v_D<0.7$, therfore
   $v_{IN} > (-3/2).7 = -1.05$
5. Done

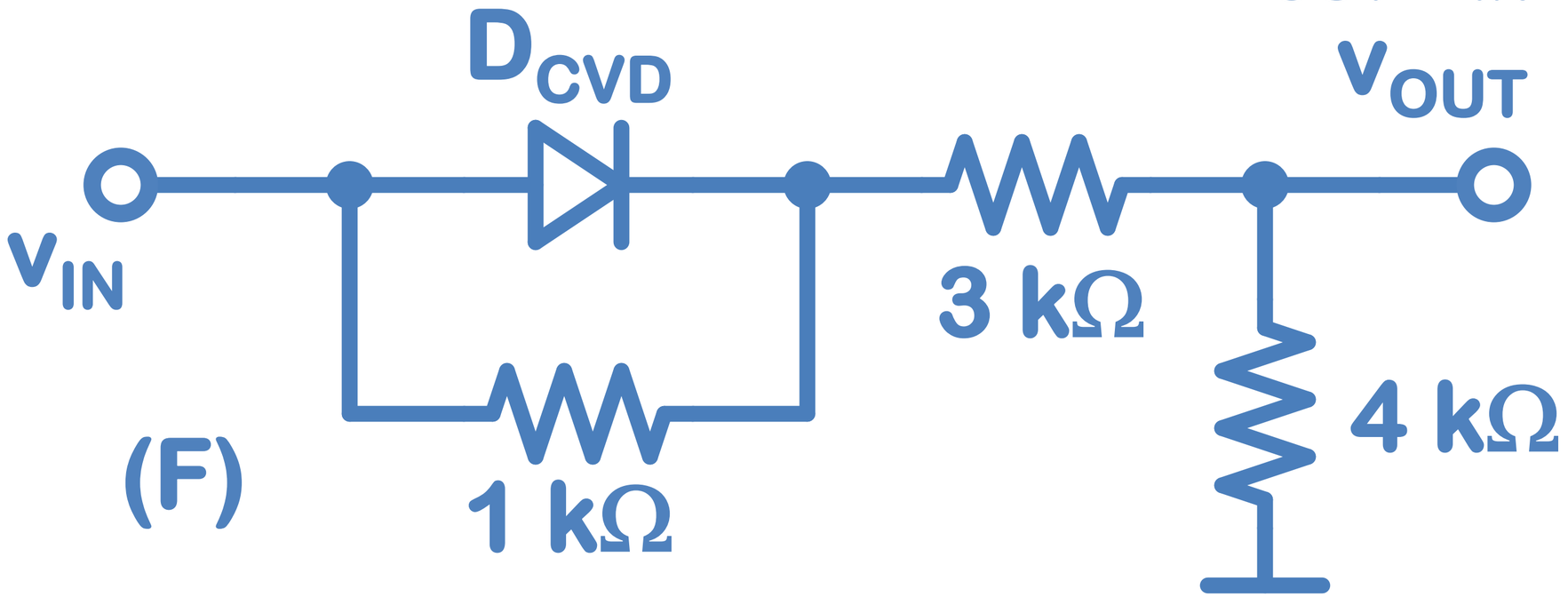
answer:

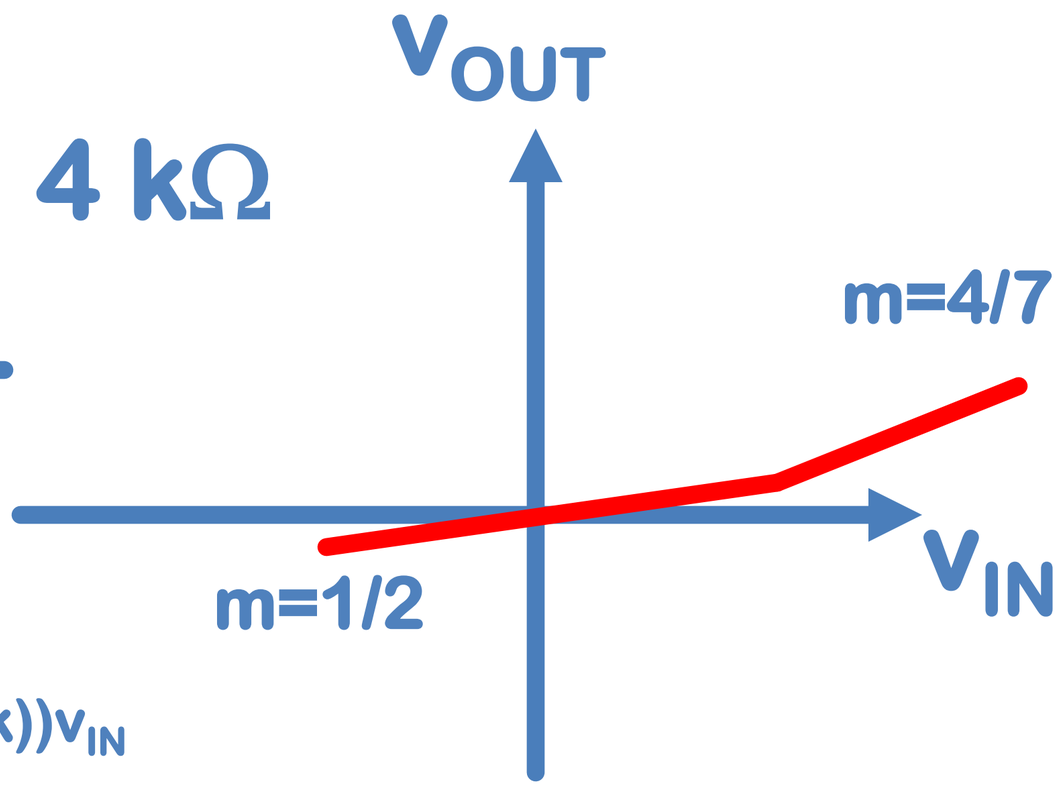
$v_{OUT} = -(3/8)0.7$, $v_{IN}<-1.05$

$v_{OUT} = (1/4)v_{IN}$, $v_{IN}>1.05$

Problem 3.

a) Find the equation and plot $v_{OUT}(v_{IN})$ for each circuit.





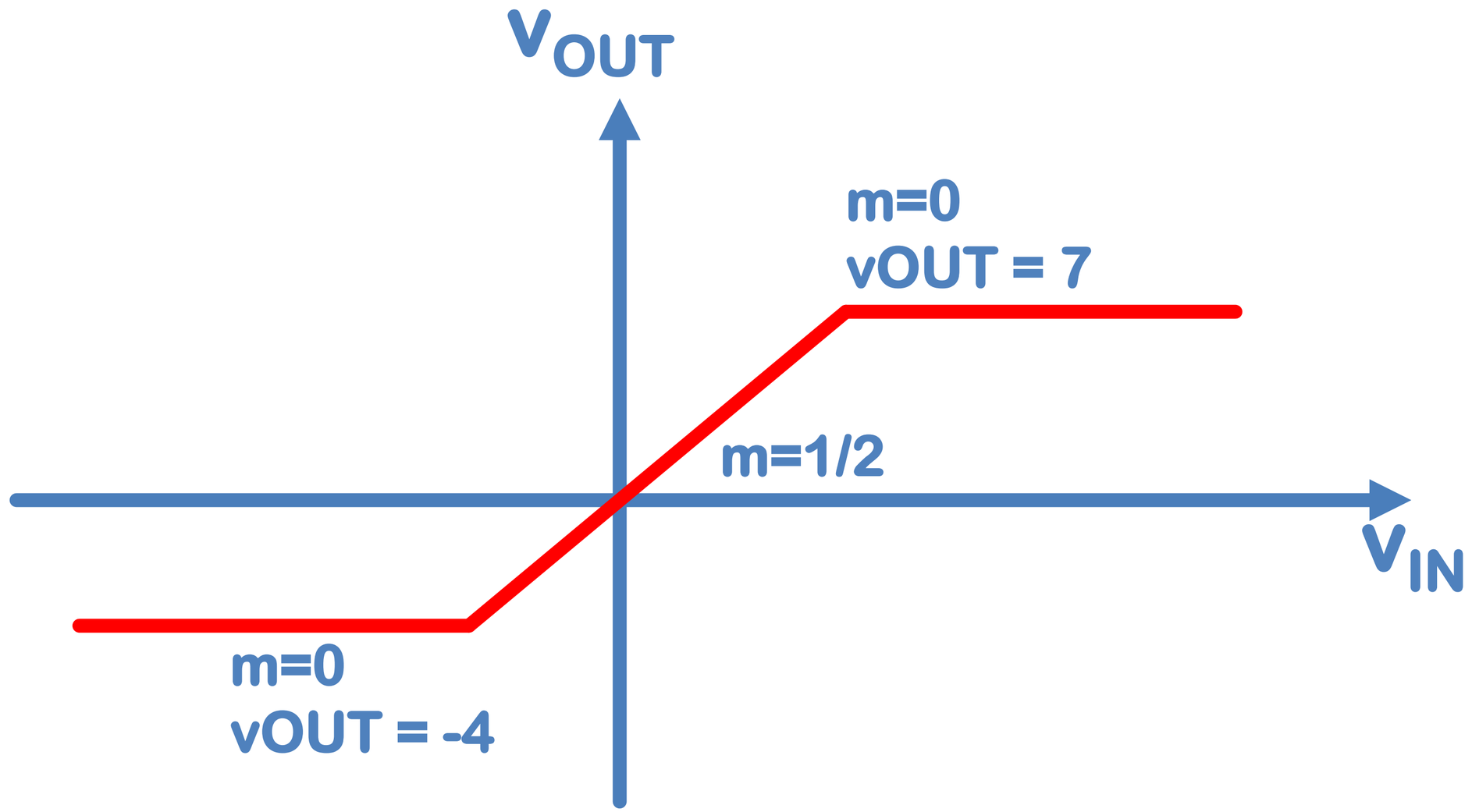
1. FB case:
2. CVD (v_D=0.7)
3. v_{OUT}=(4k/(3k+4k))(v_{IN}-0.7)
   v_{OUT} = (4/7)(v_{IN}-0.7)
   i_D = (v_{IN}-0.7)/(7k)-0.7/1k
4. apply i_D>0, therfore
   (v_{IN}-0.7)/(7k) > 0.7/1k
   v_{IN} > 5.6
5. Next

1. RB case:
2. open (i_D=0)
3. v_{OUT}=(4k/(1k+3k+4k))v_{IN}
   v_{OUT} = (1/2)v_{IN}
   v_D = (1/8)v_{IN}
4. apply v_D<0.7, therfore
   v_{IN} < 5.6
5. Done

answer:

v_{OUT} = (4/7)(v_{IN}-0.7), v_{IN}>5.6

v_{OUT} = (1/2)v_{IN}, v_{IN}<5.6



$v_{OUT}=(1/2)v_{IN}$, -(9.4) < vIN < (15.4)
vOUT=-4.7, vIN < -(9.4)
vOUT=7.7, vIN > (15.4)