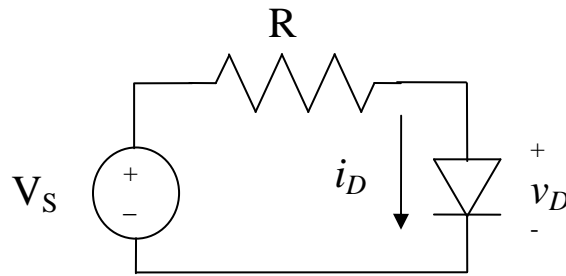


## An Iterative Example



Given:  $V_S = 1V$   
 $R = 1k$

Diode Specs.  
 $I_S = 1 \times 10^{-9} A$   
 $V_T = 25 mV$   
 $n = 2$

How to find  $v_D$  and  $i_D$  using iteration:

1. Write KVL equation.

$$V_S = Ri_D + v_D$$

2. Solve for  $i_D$  (this is the load line equation).

$$i_D = -(1/R)v_D + V_S / R \quad [\text{Eq.1}]$$

3. Solve William Shockley's Diode Equation for  $v_D$ .

$$v_D = nV_T \ln(i_D / I_S + 1) \quad [\text{Eq.2}]$$

*Note: Eqs. 1 and 2 can now be used to iterate and solve for  $v_D$  and  $i_D$ .*

4. Select a reasonable (but arbitrary) value of  $i_D$ , plug into Eq.2 and solve for a value of  $v_D$  (e.g. start with  $i_D = 1\text{mA}$ ).
5. Substitute the value of  $v_D$  from step 4 into Eq.1 and solve for  $i_D$ .
6. Repeat steps 4 and 5 until values of  $v_D$  and  $i_D$  converge.

$i_D$ (mA)	$v_D$ (V)
1.0000	0.6908
0.3092	0.6321
0.3679	0.6408
0.3592	0.6396
0.3604	0.6398
0.3602	0.6397
0.3603	0.6397
0.3603	0.6397

Done!