

Diode = chapter 4

Strig. 4.11 = forward

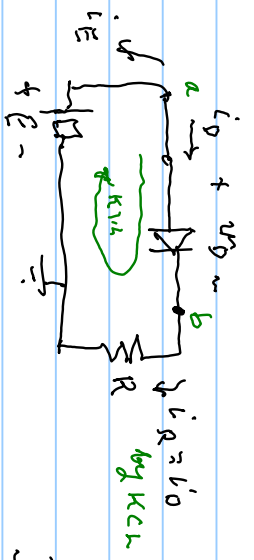
Strig. 4.14 = small signal

Strig. 4.19 = break down

Diode



Physics path = SPB-17.2 (total) *not used* library physics



Load line;  $v_D = E - R(i_D)$  by KVL

$i_E =$

$v_D + R(i_D) - E = 0$

$\Rightarrow -i_E = \frac{E - v_D}{R}$

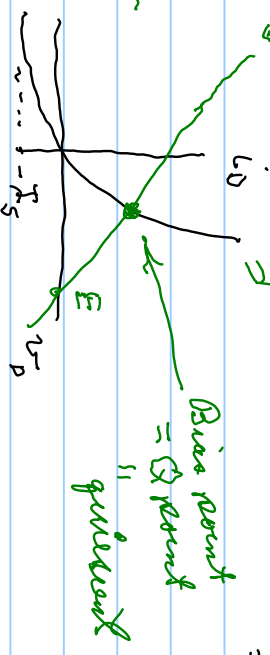
Load line slope =  $-1/R = -G$

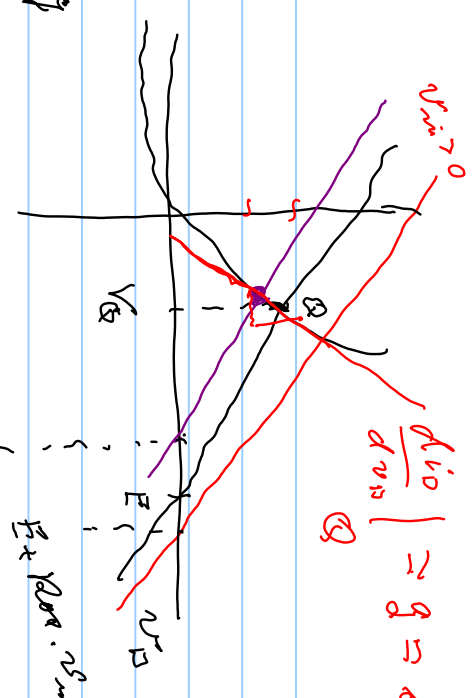
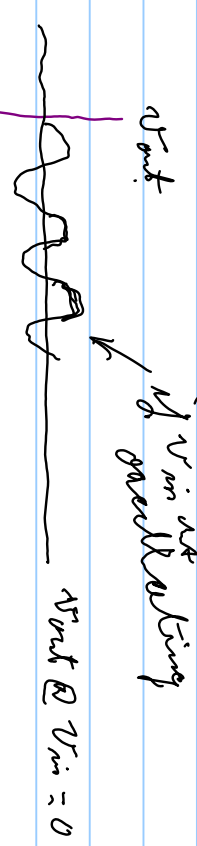
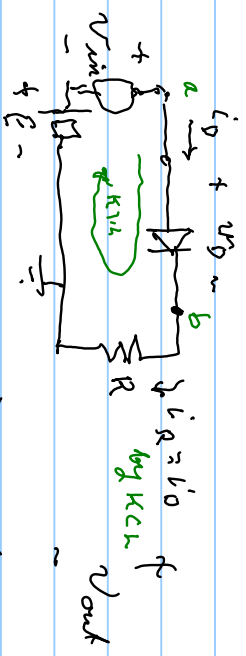
$i_D = I_S (e^{v_D/V_T} - 1)$

$V_T = 26mV$  thermal voltage

$= \frac{kT}{q}$

@ room T temp





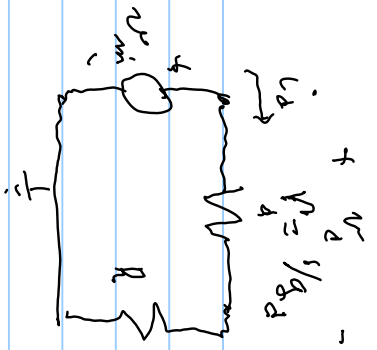
$\left. \frac{di_D}{dv_D} \right|_Q \approx g \Rightarrow$  small signal conductance

small signal  $|v_{in}| \ll V_D$  linearize about Q point

1st Taylor series  $f(x) \approx f(x_0) + \frac{df}{dx} \Big|_{x=x_0} (x - x_0) + \underbrace{2nd, 3rd, \dots \text{th of derivatives}}_{\text{ignores if small signal}}$

nodes  $i_D - I_D \approx i_D'$

small signal model



small signal model

