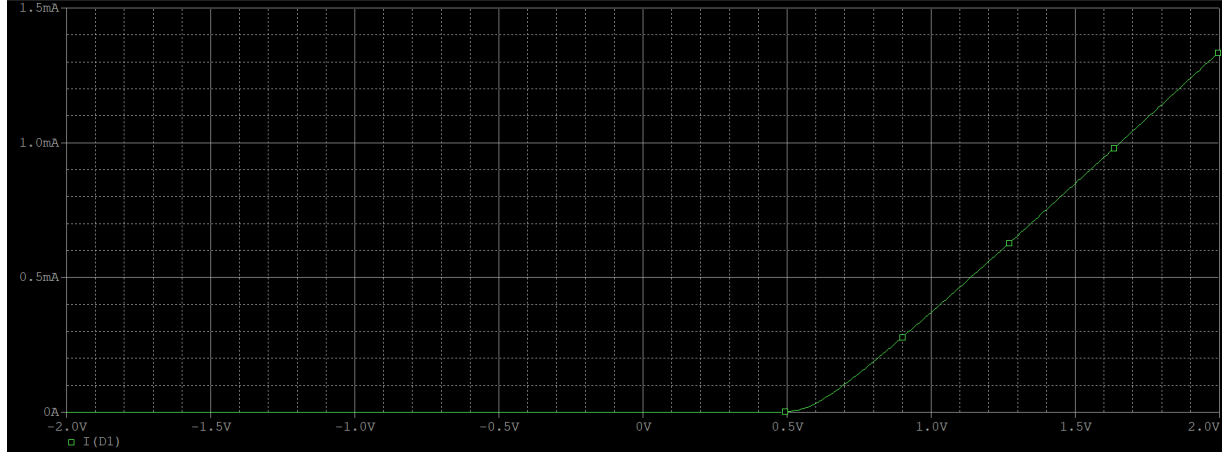


### Problem 2.(a)



According to diode's voltage-current relation

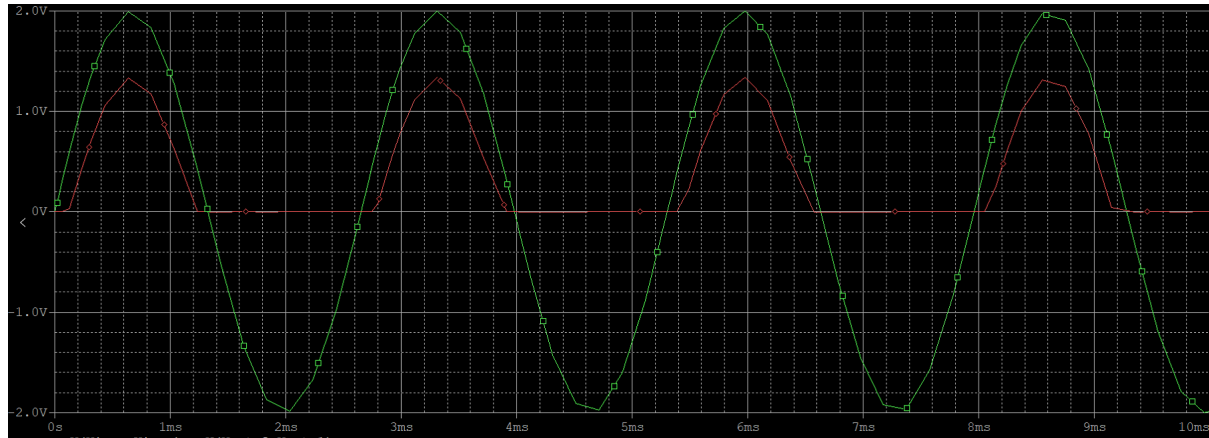
$$I_D = I_s(e^{\frac{qV_a}{kT}} - 1)$$

and the current relation

$$V = V_a + 1000I_d = 1000I_d + \frac{kT}{q} \ln\left(\frac{I_d}{I_s} + 1\right)$$

Since  $\frac{kT}{q} = 0.0258$  so the second part of  $V$  can be omitted and as a result  $I_d = \frac{V}{1000}$  so the current is increasing linearly.

### Problem 2.(b)



The green line represents for the  $V_{in}$  and the red line represents for the  $V_{out}$ , so the circuit can stop the current when the input voltage is negative and decrease the voltage for the resistor when the input voltage is positive.