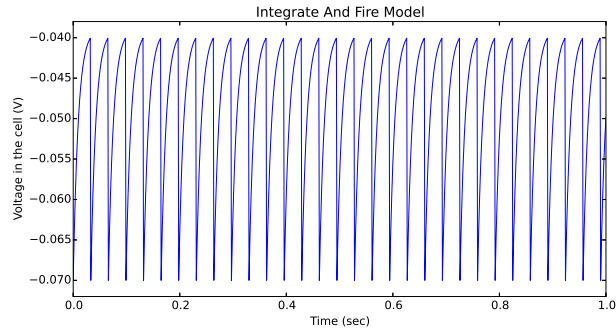


## Part 1



## Part 2 a)

$$\tau_m \frac{dV}{dt} = E_L - V + R_m I$$

$$\frac{dV}{dt} = \frac{E_L - V + R_m I}{\tau_m}$$

The minimum value of  $I$  that produces an action potential is the value  $I$  has when  $V$  has reached the threshold value and the function is constant. A function is constant when its derivative is equal to zero.

$$\frac{dV}{dt} = \frac{E_L - V + R_m I}{\tau_m} = 0$$

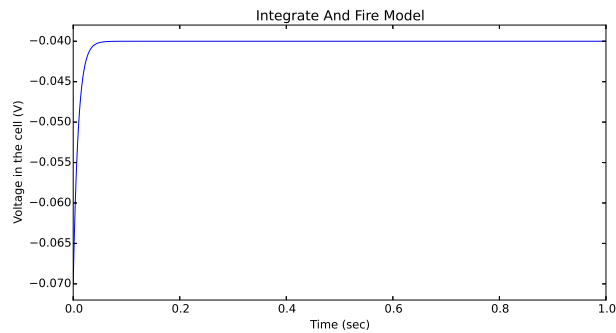
$$E_L - V + R_m I = 0$$

$$I_{min} = \frac{E_L - V}{R_m}$$

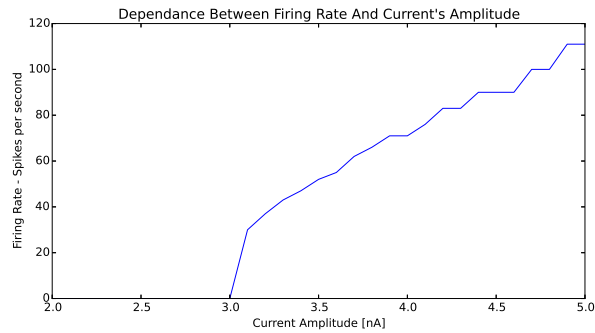
$$I_{min} = \frac{-70mV + 40mV}{10M\Omega}$$

$$I_{min} = 3nA$$

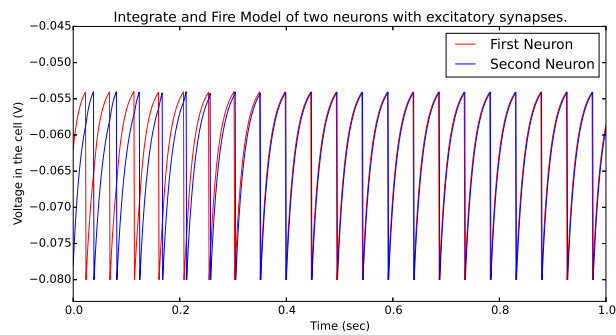
## Part 2 b)



### Part 3

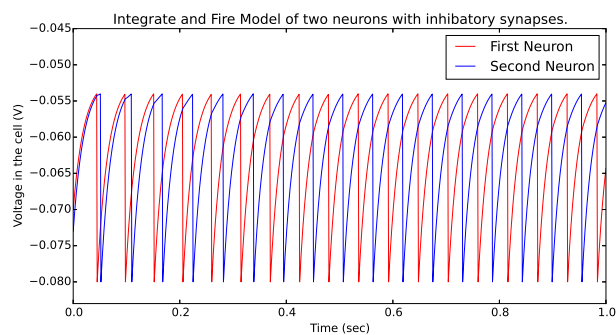


### Part 4 a)



When the synapses are excitatory, the spikes of the two neurons synchronize after a few synapses.

### Part 4 b)



When the synapses are inhibitory, the spikes of the two neurons diverge.