

**Methods of Applied Mathematics II (Math 451H)**  
**Spring 2014**

**Modeling Assignment II**

Build an isopotential integrate-and-fire model based on the passive membrane equation used in Modeling Assignment 1 with  $C = 1$ ,  $G_L = 0.1$ ,  $E_L = -65$ ,  $V_{th} = -50$ ,  $V_{rst} = -65$ ,  $I_{in}(t) = 0$ .

1. Calculate the time constant  $\tau = C / G_L$ .
2. Plot the numerical results for
  - (a)  $I_{app} = 1$ .
  - (b)  $I_{app} = 1.5$ .
  - (c)  $I_{app} = 1.6$ .
3. Compute the threshold value of the DC current  $I_{app}$  to 2 decimals of accuracy.
4. Derive a formula to compute the firing frequency.
5. Compare your numerical results with the results using the derived formula.