Lab Y

Model DB

SenseLab ModelDB

Spike timing detection in different forms of LTD (Doi et al 2005)

Accession: 49305

To understand the spike-timing detection mechanisms in cerebellar long-term depression (LTD), we developed a kinetic model of Ca dynamics within a Purkinje dendritic spine. In our kinetic simulation, IP3 was first produced via the metabotropic pathway of parallel fiber (PF) inputs, and the Ca influx in response to the climbing fiber (CF) input triggered regenerative Ca-induced Ca release from the internal stores via the IP3 receptors activated by the increased IP3. The delay in IP3 increase caused by the PF metabotropic pathway generated the optimal PF–CF interval. The Ca dynamics revealed a threshold for large Ca2 release that decreased as IP3 increased, and it coherently explained the different forms of LTD. See paper for more and details.

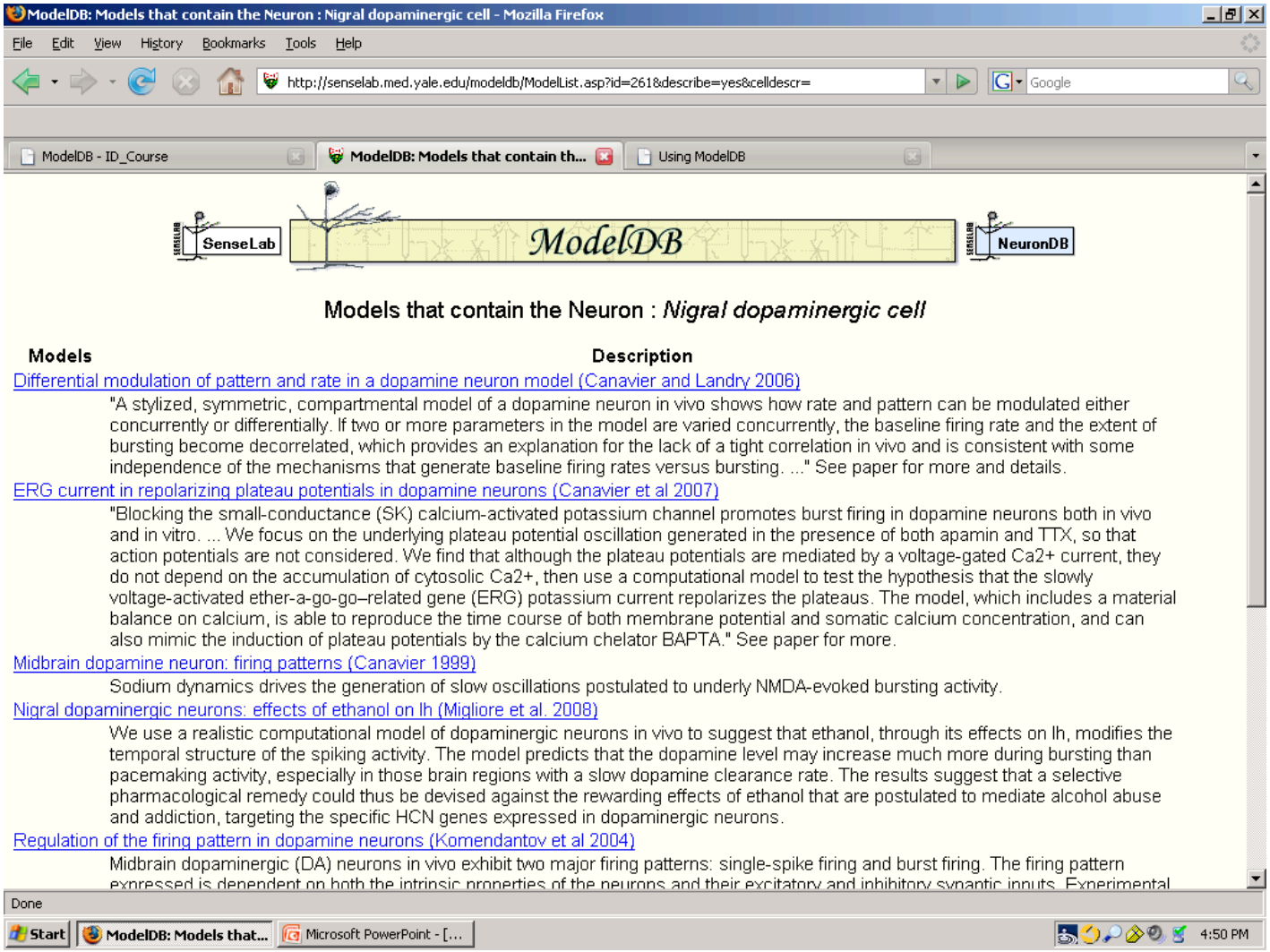
Reference: Doi T, Kuroda S, Michikawa T, Kawato M (2005) Inositol 1,4,5-trisphosphate-dependent Ca2+ threshold dynamics detect spike timing in cerebellar Purkinje cells. *J Neurosci* **25**:950-61 [PubMed]

Citations Citation Browser

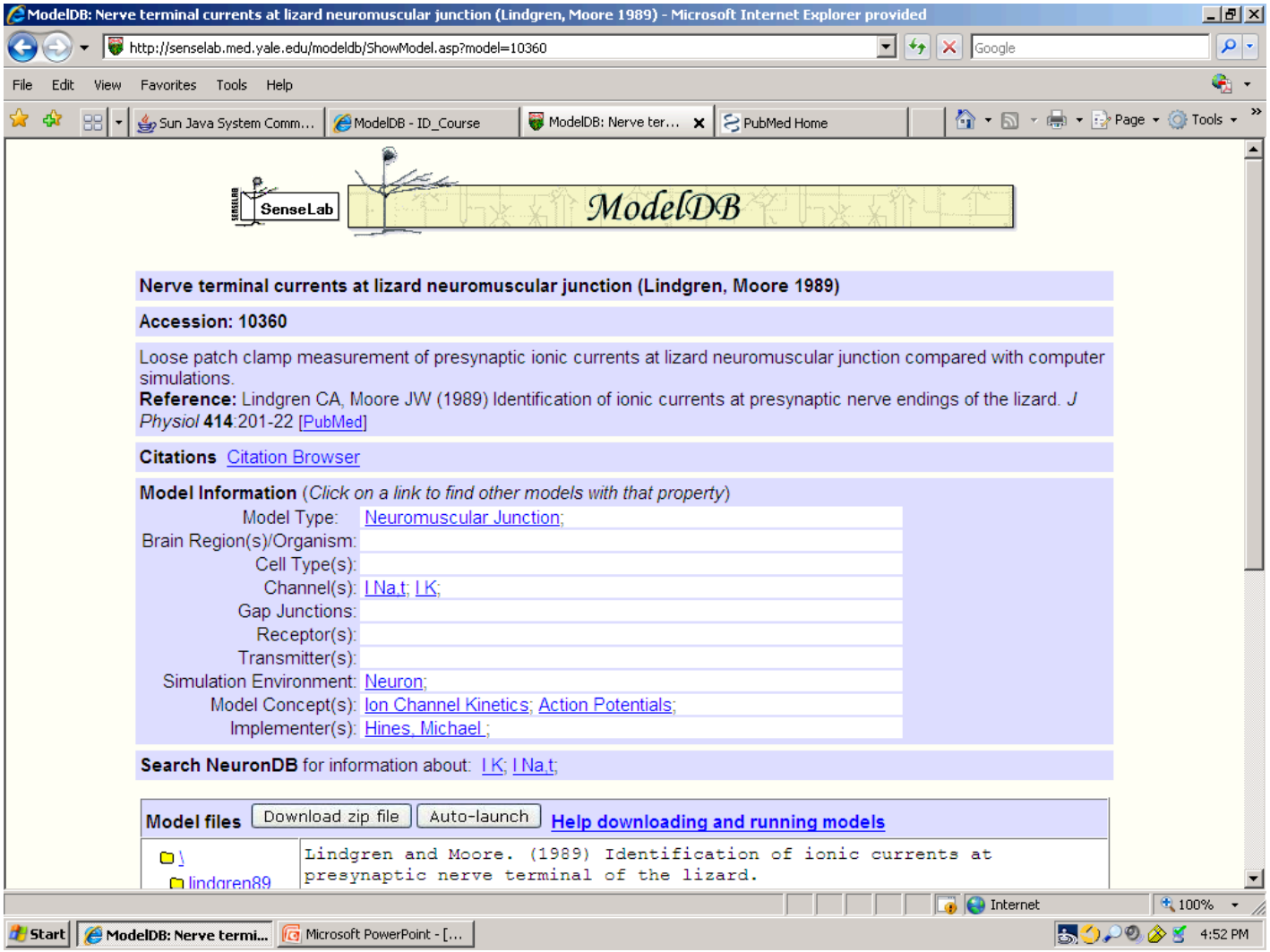
Model Information (*Click on a link to find other models with that property*)

Model Type:	Synapse;
Brain Region(s)/Organism:	
Cell Type(s):	Cerebellar purkinje cell;
Channel(s):	I Calcium;
Gap Junctions:	
Receptor(s):	
Transmitter(s):	Glutamate;

Homework Y.1 : Subsantia Nigra



Y.1


ModelDB: Nerve terminal currents at lizard neuromuscular junction (Lindgren, Moore 1989) - Microsoft Internet Explorer provided
http://senselab.med.yale.edu/modeldb/ShowModel.asp?model=10360
File Edit View Favorites Tools Help
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SenseLab
ModelDB
Nerve terminal currents at lizard neuromuscular junction (Lindgren, Moore 1989)
Accession: 10360
Loose patch clamp measurement of presynaptic ionic currents at lizard neuromuscular junction compared with computer simulations.
Reference: Lindgren CA, Moore JW (1989) Identification of ionic currents at presynaptic nerve endings of the lizard. J Physiol 414:201-22 [PubMed]
Citations Citation Browser
Model Information (Click on a link to find other models with that property)
Model Type: Neuromuscular Junction;
Brain Region(s)/Organism:
Cell Type(s):
Channel(s): I Na,t; I K;
Gap Junctions:
Receptor(s):
Transmitter(s):
Simulation Environment: Neuron;
Model Concept(s): Ion Channel Kinetics; Action Potentials;
Implementer(s): Hines, Michael ;
Search NeuronDB for information about: I K; I Na,t;
Model files
Download zip file
Auto-launch
Help downloading and running models
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lindgren89
Lindgren and Moore. (1989) Identification of ionic currents at presynaptic nerve terminal of the lizard.
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ModelDB: Nerve termi...
Microsoft PowerPoint - [...
4:52 PM

Site of impulse initiation in a neuron (Moore et al 1983)

Accession: 9852

Examines the effect of temperature, the taper of the axon hillock, and HH channel density on antidromic spike invasion into the soma and spike initiation under dendritic stimulation.
Reference: Moore JW, Stockbridge N, Westerfield M (1983) On the site of impulse initiation in a neurone. *J Physiol* **336**:301-11 [PubMed]

Citations Citation Browser

Model Information (*Click on a link to find other models with that property*)

Model Type:	Neuron or other electrically excitable cell;
Brain Region(s)/Organism:	
Cell Type(s):	Spinal motor neuron;
Channel(s):	I Na,t; I K;
Gap Junctions:	
Receptor(s):	
Transmitter(s):	
Simulation Environment:	Neuron;
Model Concept(s):	Action Potential Initiation; Simplified Models;
Implementer(s):	Hines, Michael ;

Search NeuronDB for information about: Spinal motor neuron; I K; I Na,t;

Model files Download zip file | Auto-launch **Help downloading and running models**

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Moore, Stockbridge, and Westerfield. (1983) On the site of impulse initiation
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1: J Physiol. 1983 Mar;336:301-11.

Related Articles, Links

On the site of impulse initiation in a neurone.

Moore JW, Stockbridge N, Westerfield M.

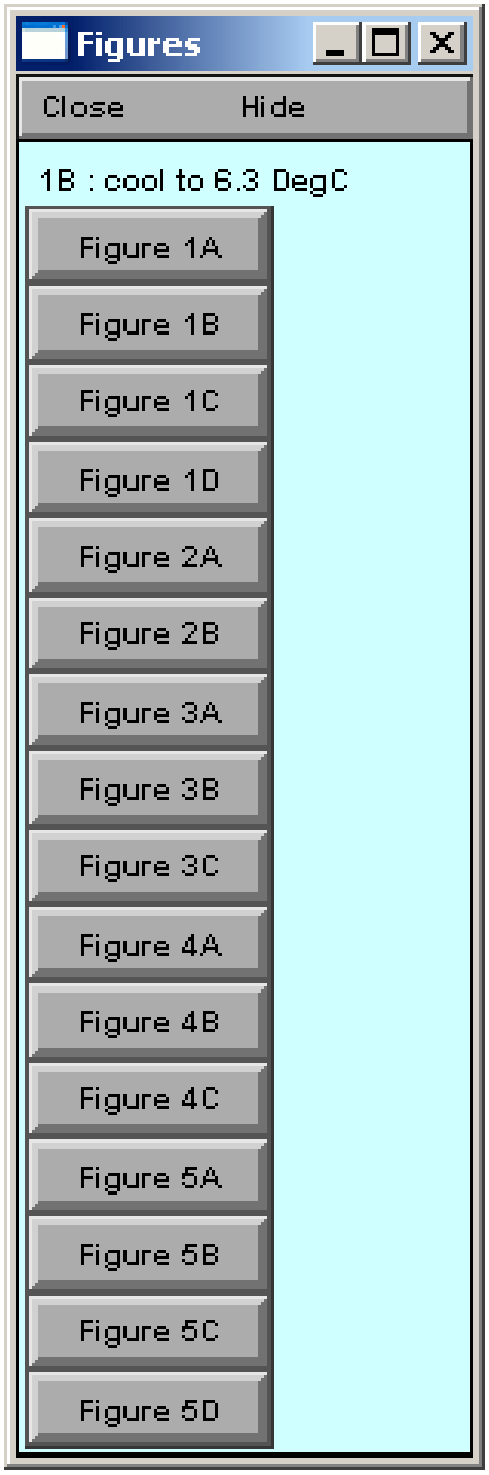
In the preceding paper (Moore & Westerfield, 1983) the effects of changes in membrane properties and non-uniform geometry on impulse propagation and threshold parameters were investigated. In this paper the contributions of these and other parameters to the site of initiation of an impulse were determined by computer simulations using the Hodgkin-Huxley membrane description, the cable equations, and geometry appropriate for a simplified motoneurone with a non-myelinated axon. Antidromic invasion of action potentials into the soma was found to depend upon (a) the ionic channel rate constants (determined by the temperature), (b) the abruptness of the transition from the small-diameter axon to the larger diameter (and increased load) of the soma-dendrite, (c) extensions of active properties into the dendrite, and (d) density of ion channels. The location of the apparent site of initiation of impulses was not necessarily at the site of synaptic input nor the nearest active membrane. Its position depended upon (a) the fraction of the dendritic tree with excitable membrane, and secondarily on (b) the stimulus strength. Even with uniform excitability in the active membrane, the apparent site of initiation could be moved a considerable distance from the soma and the site of stimulation by appropriate choice of the various parameters noted above.

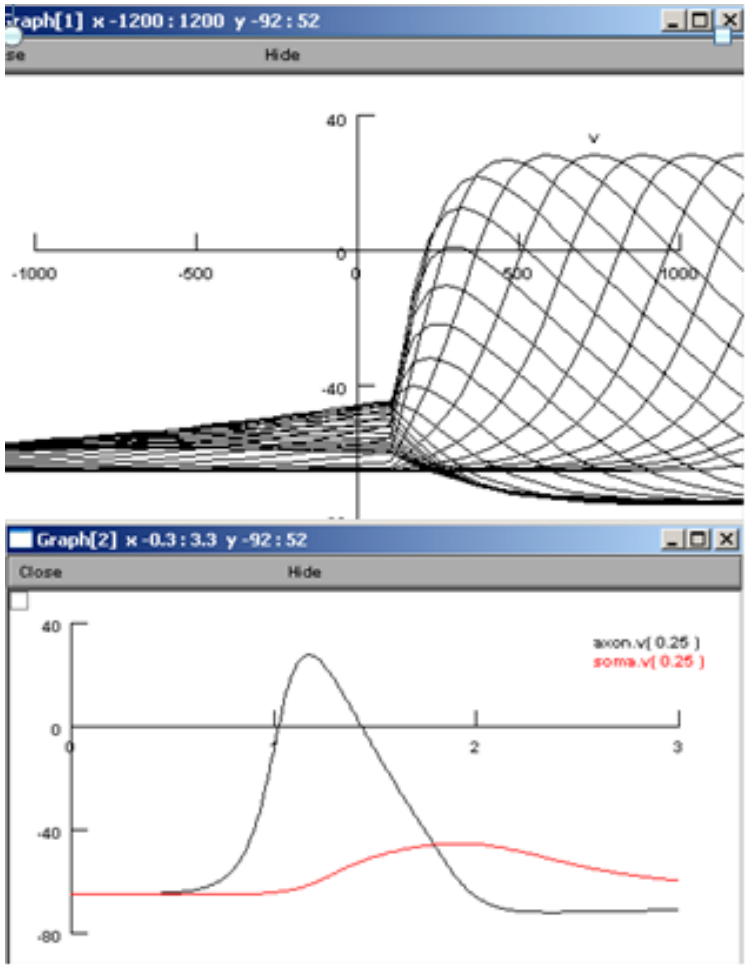
Publication Types:

- Research Support, U.S. Gov't, P.H.S.

PMID: 6308224 [PubMed - indexed for MEDLINE]

Homework Y.5





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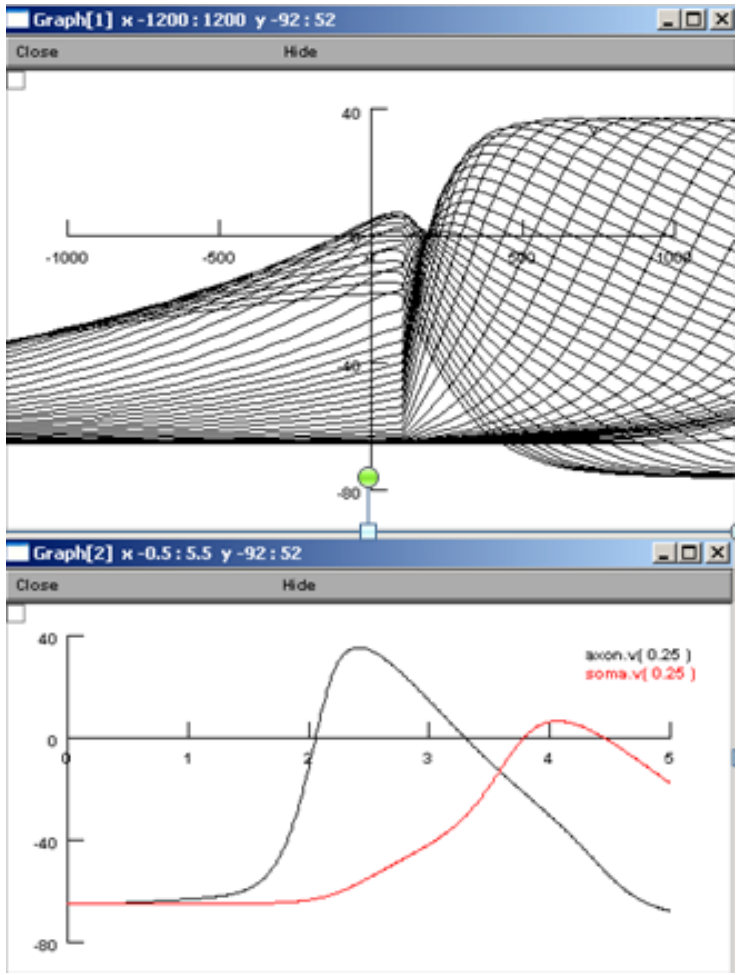
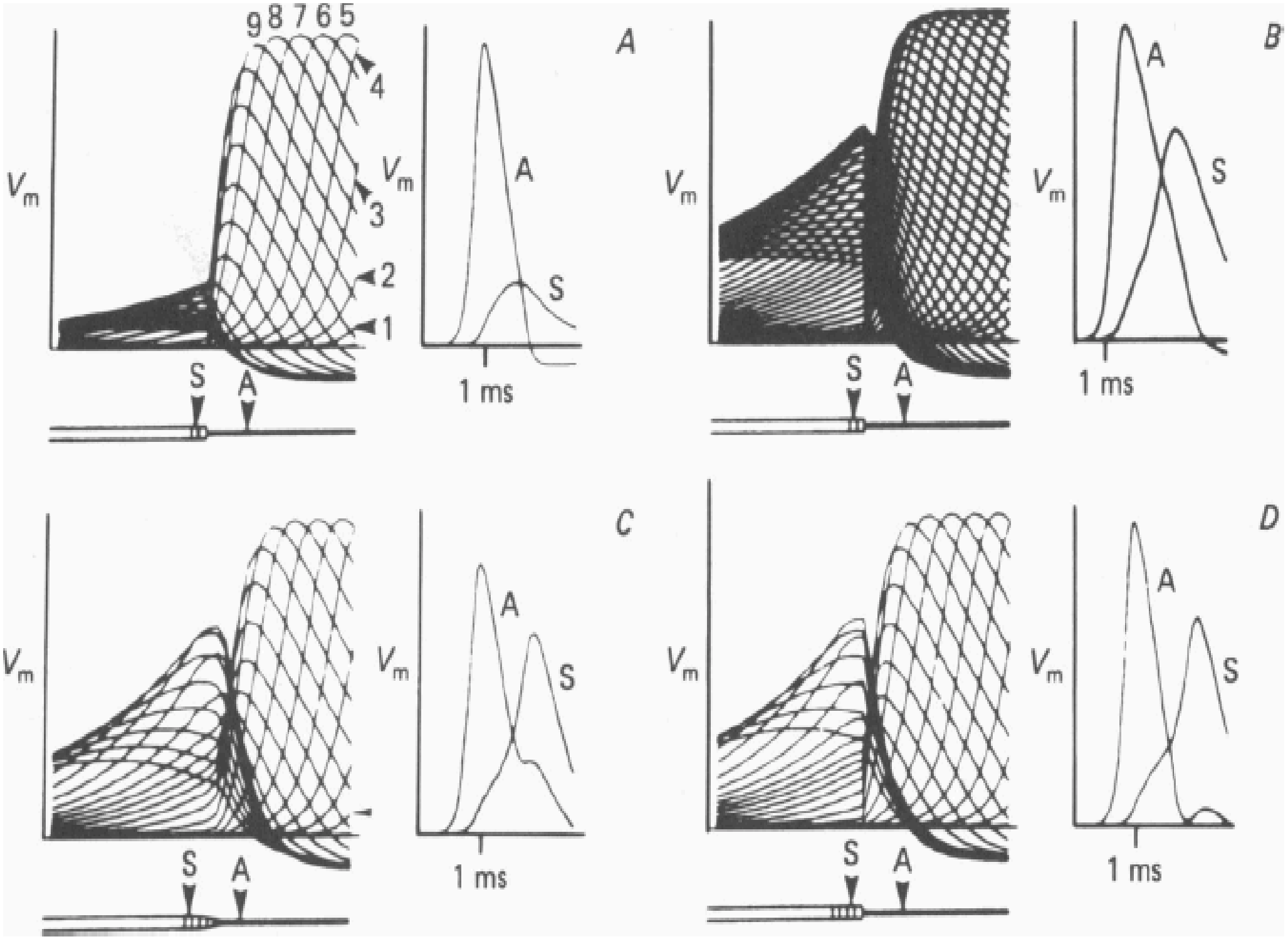


Figure B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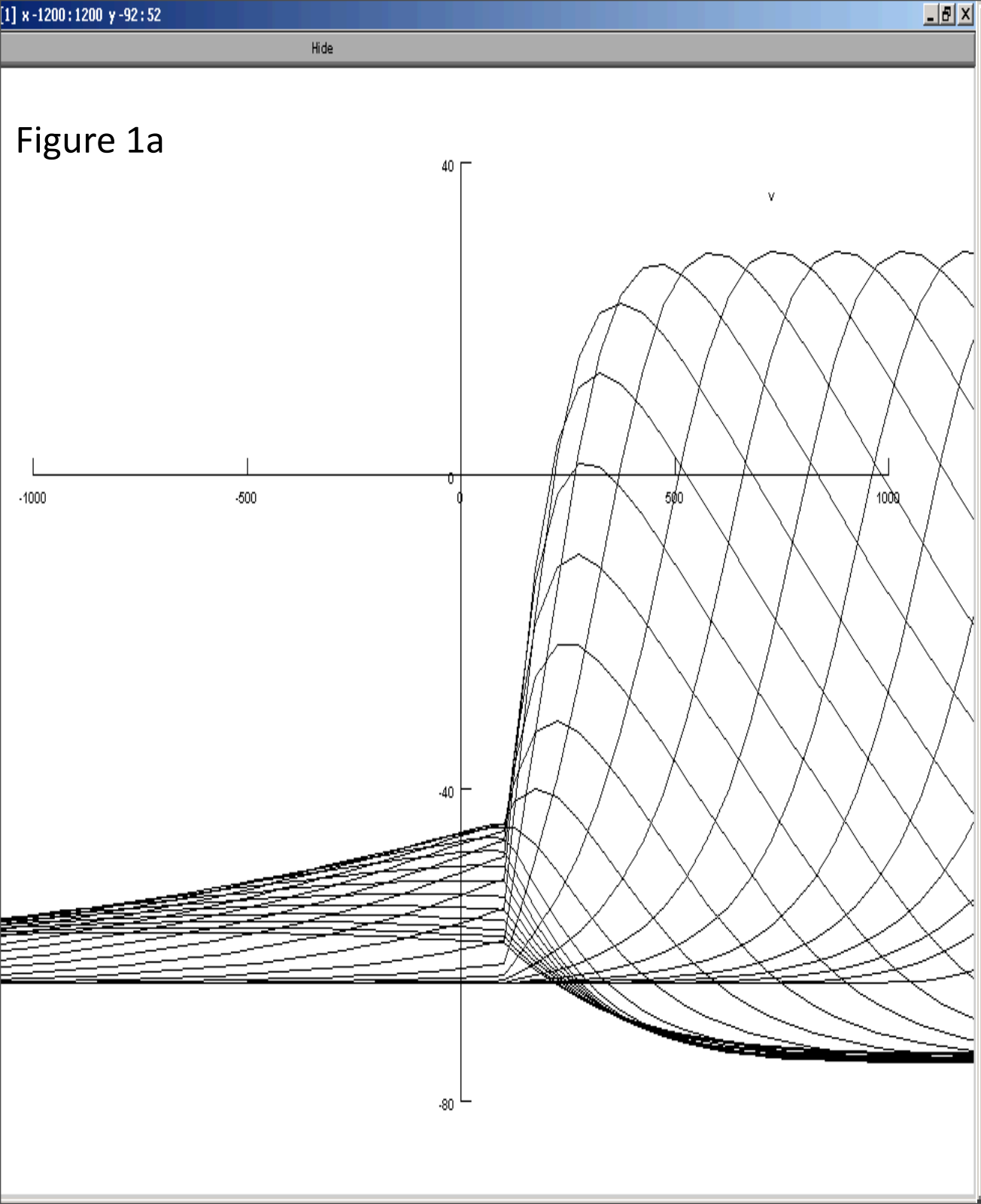
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Figure 1a
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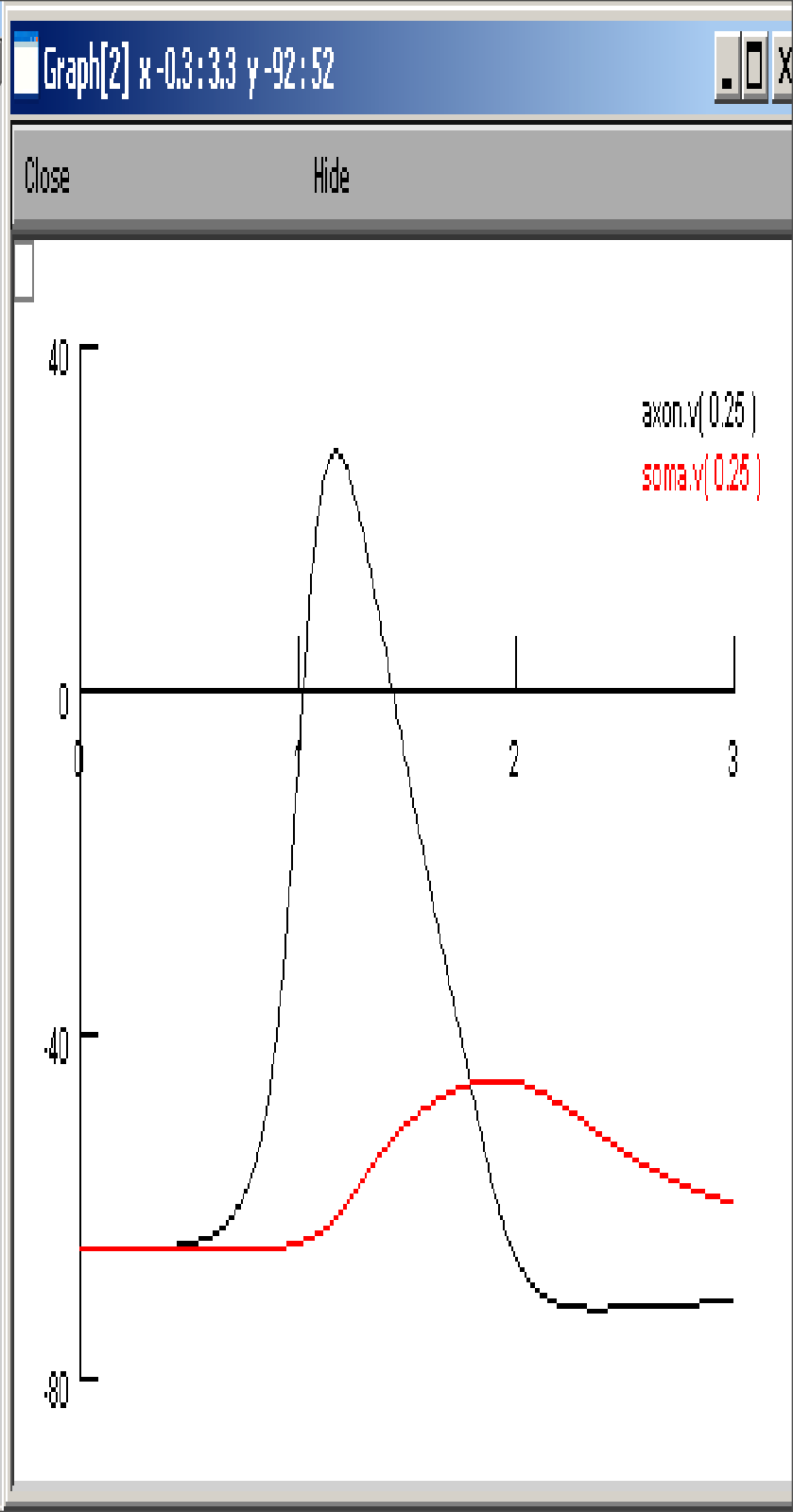
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soma.v(0.25)
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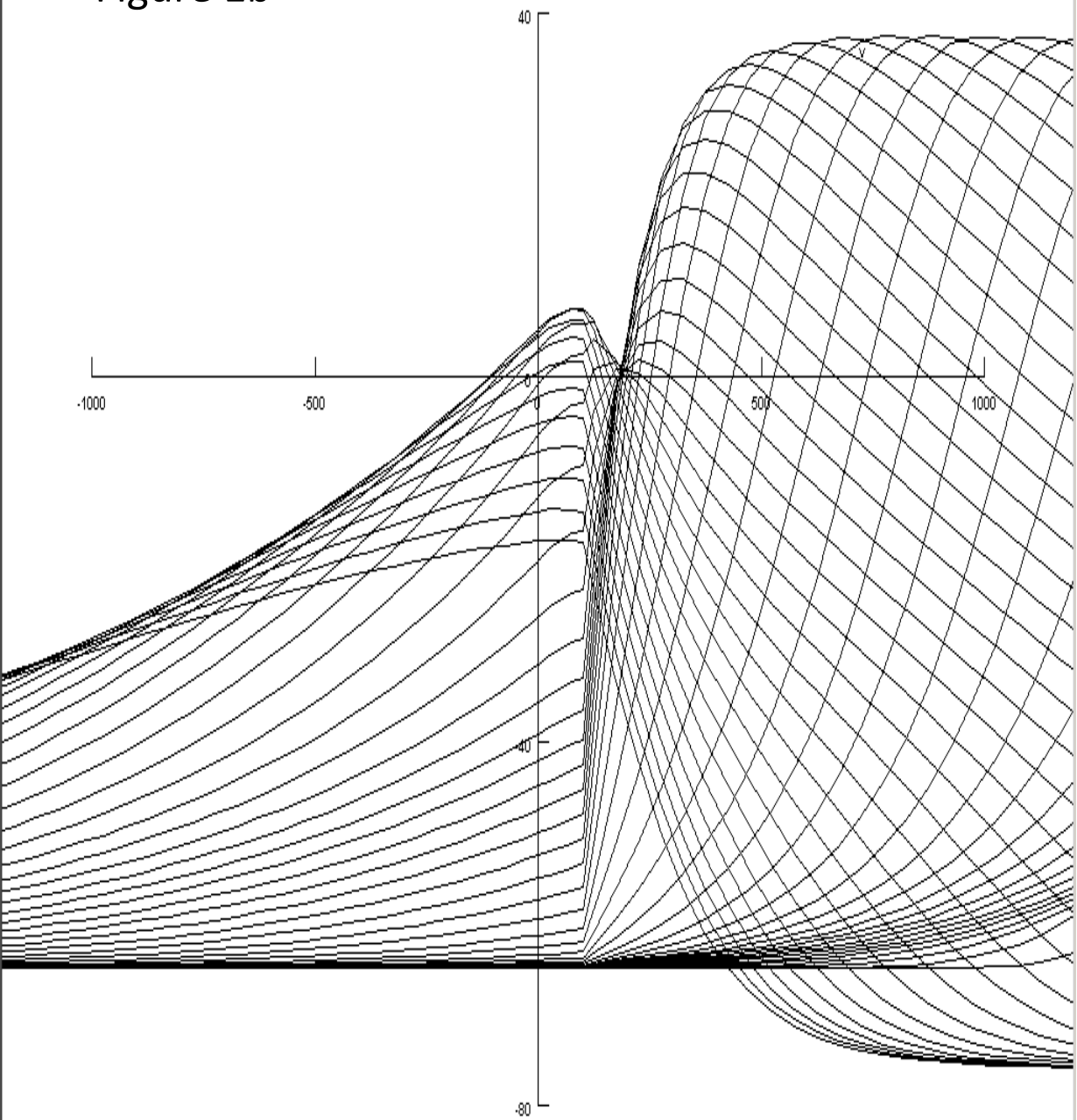
Graph[1] x -1200 : 1200 y -92 : 52

Close Hide

Figure 1b



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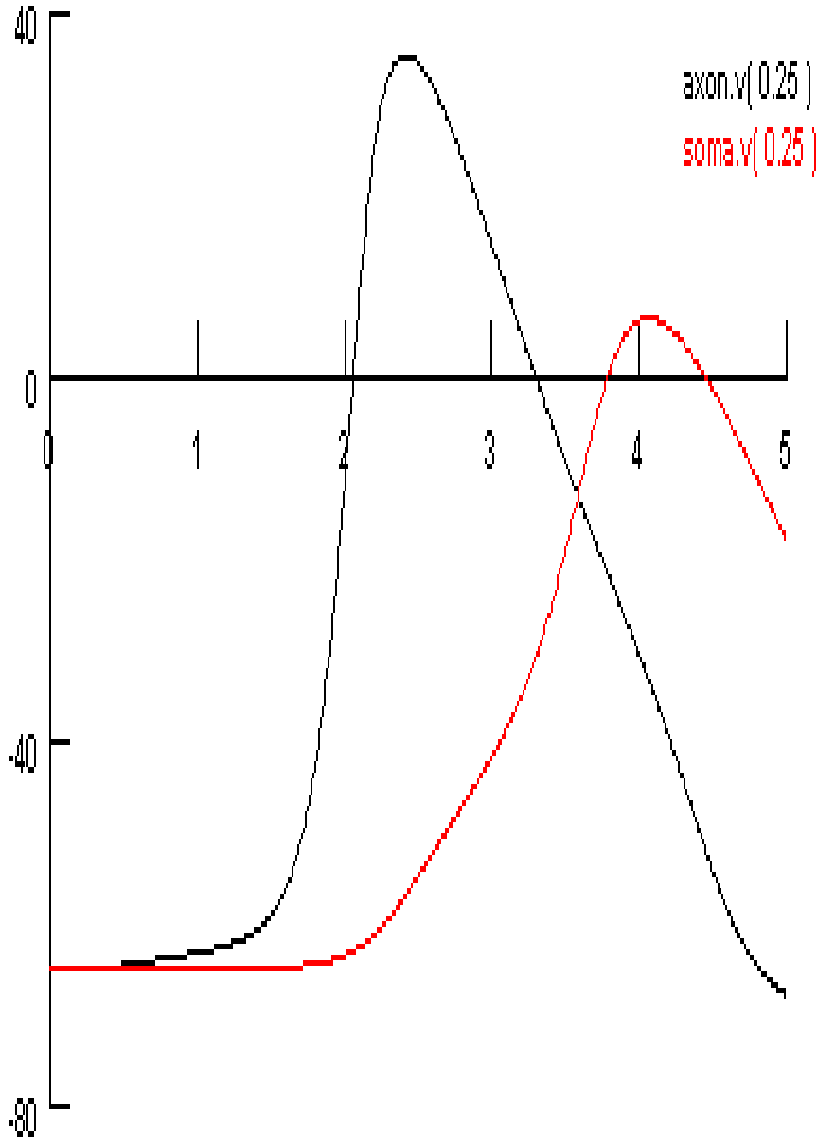
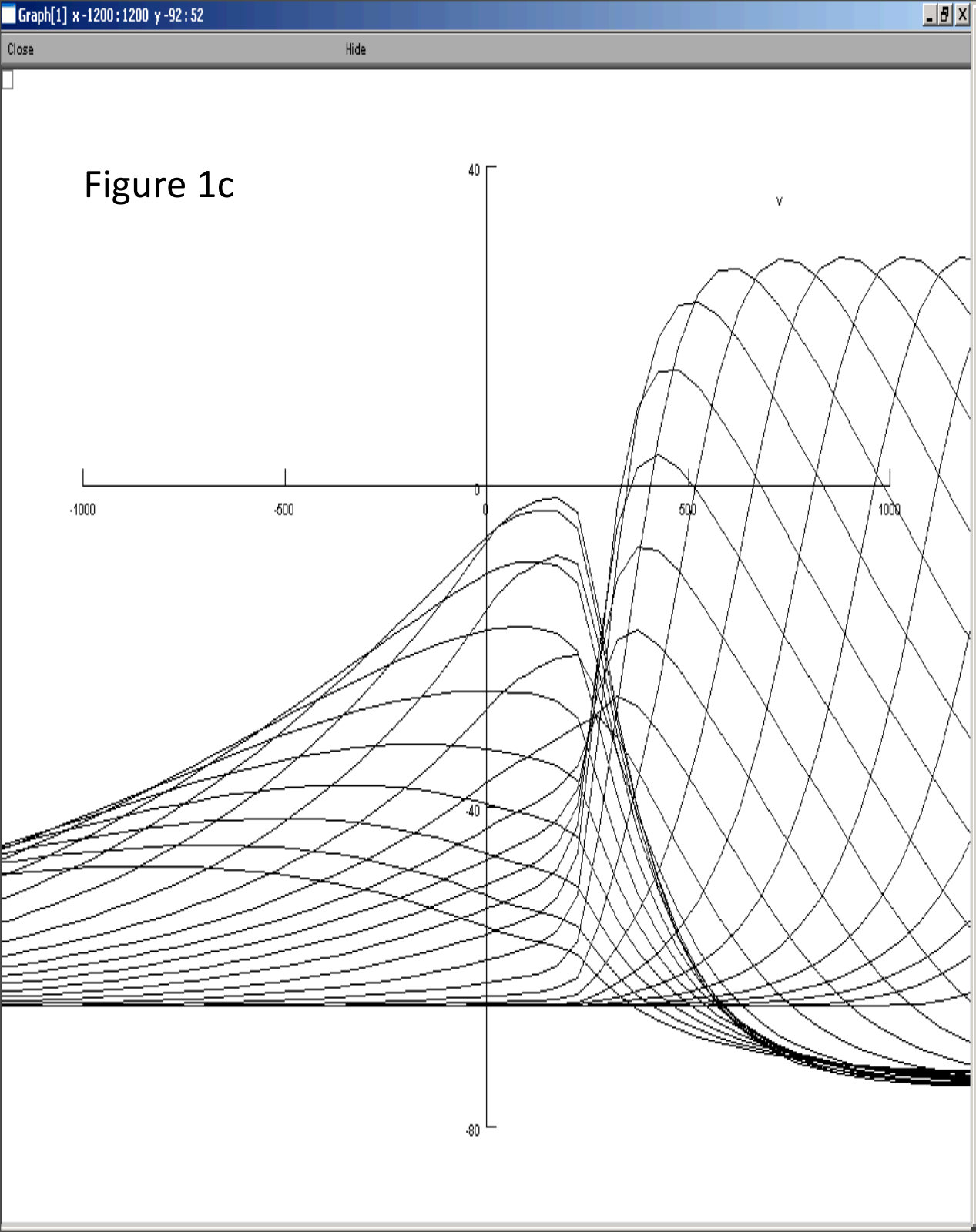


Figure 1c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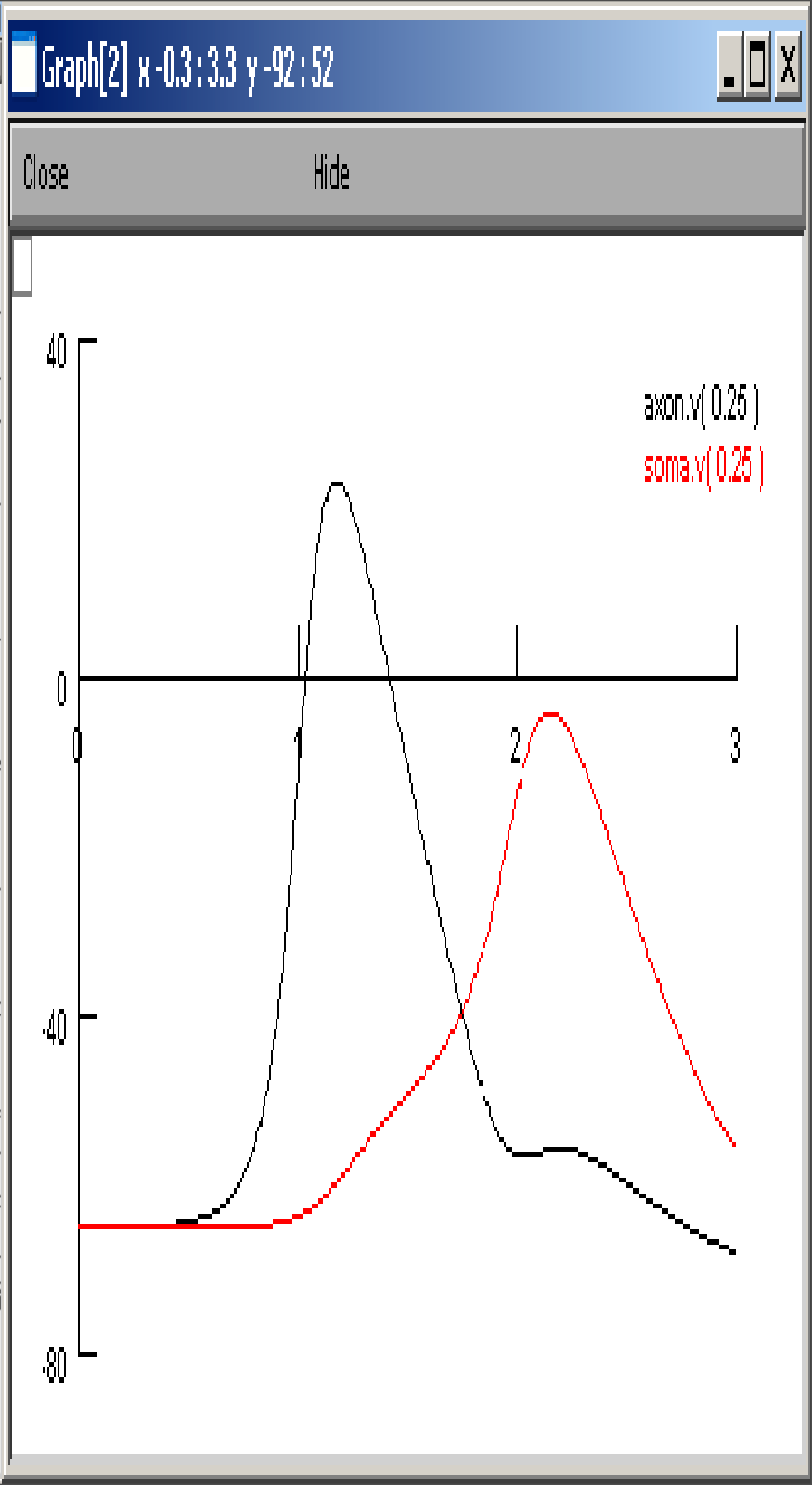
Graph[2] x -0.3 : 3.3 y -92 : 52
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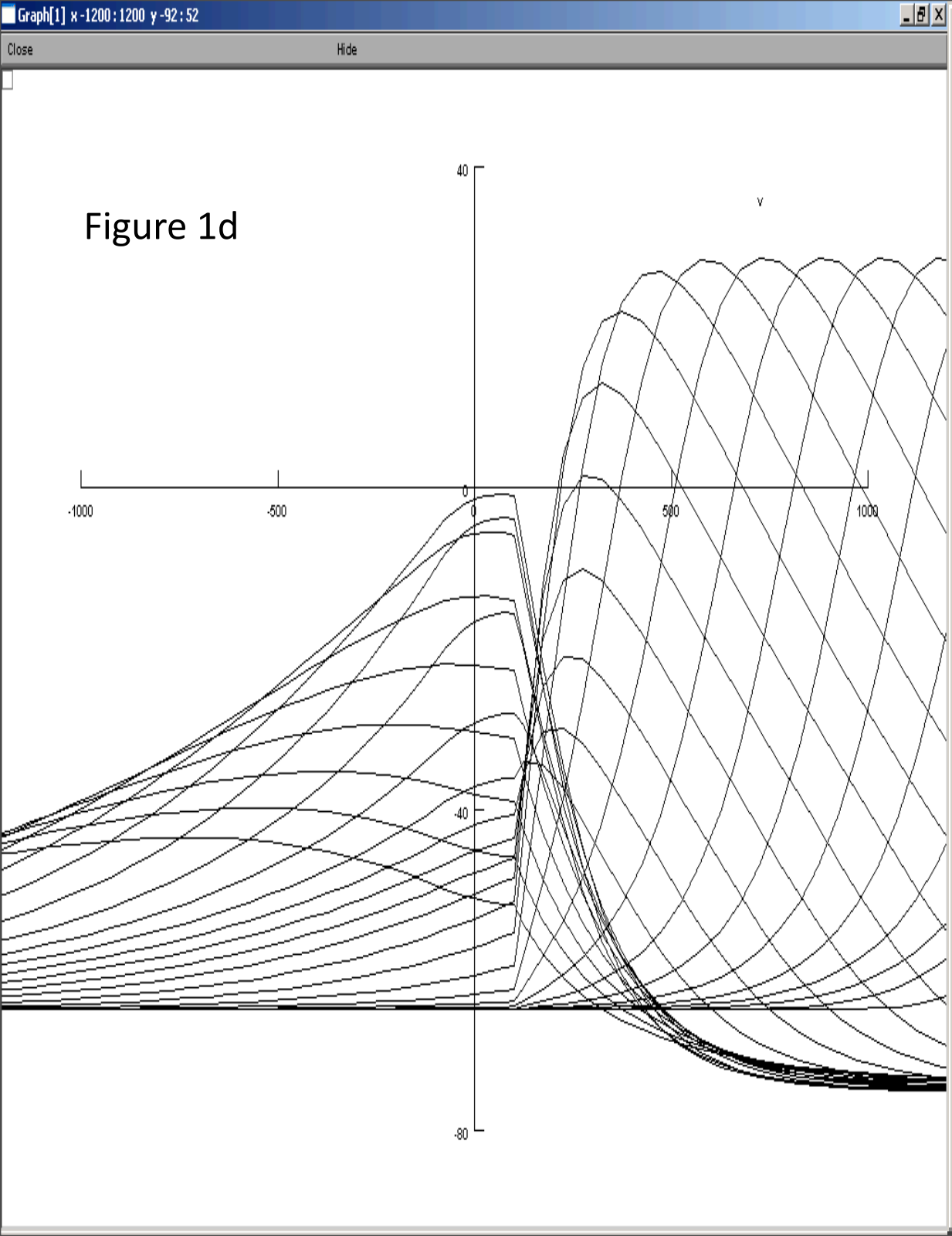
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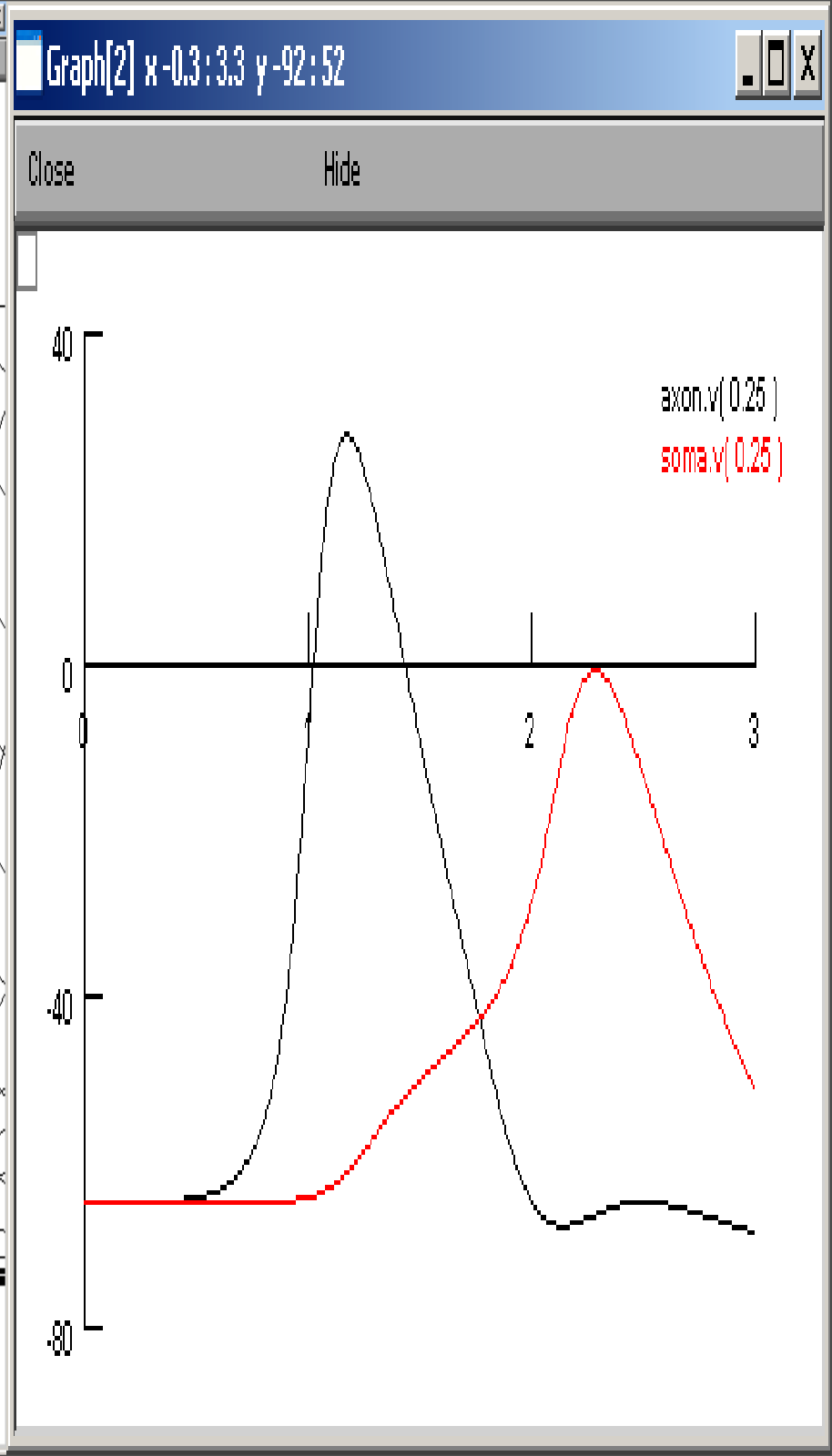
Figure 1d


Graph[2] x -0.3 : 3.3 y -92 : 52
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soma.v(0.25)