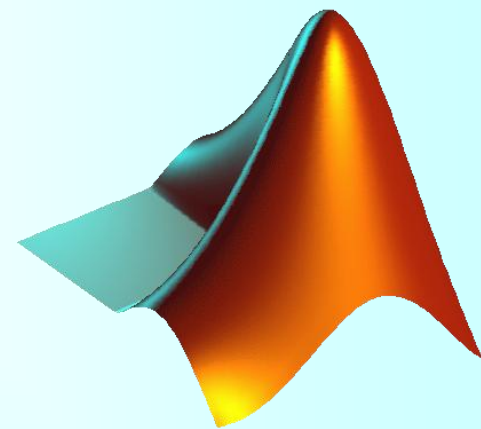
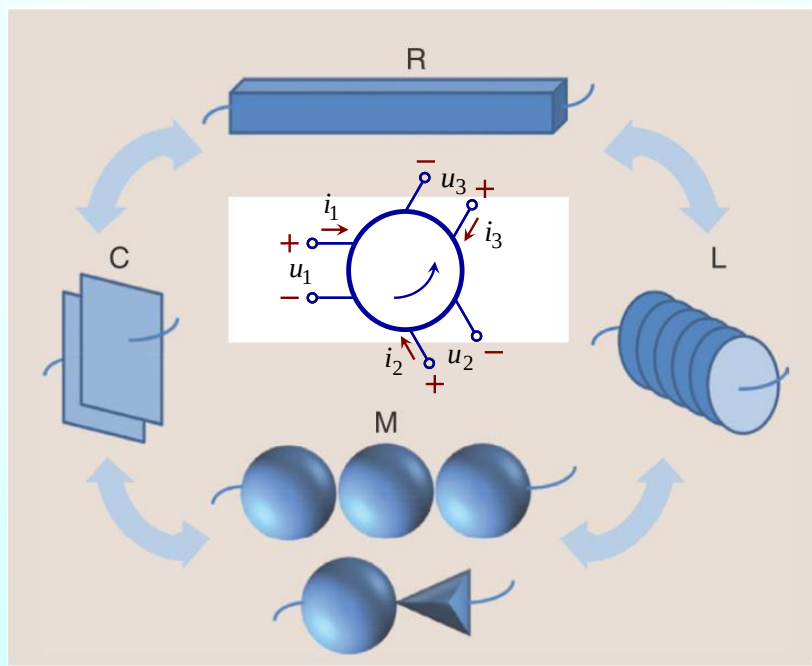


Практикум из рачунарске анализе кола



Милка Потребих



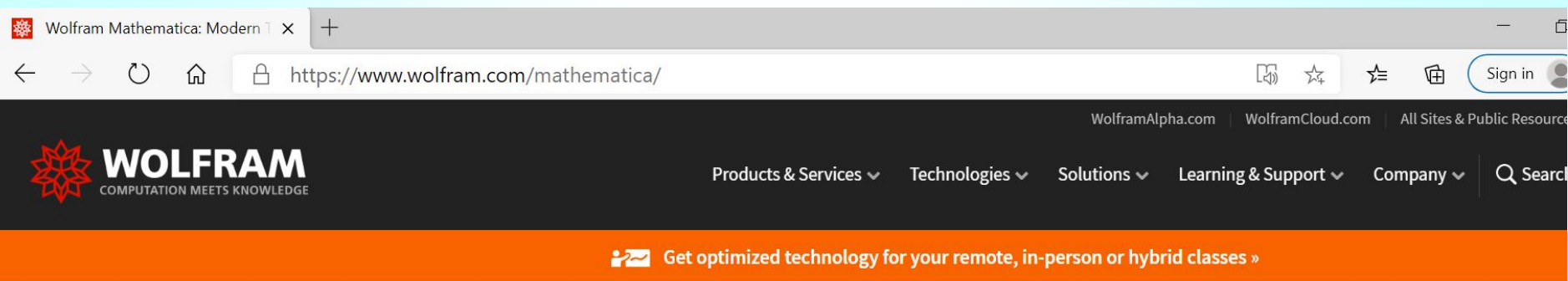
Рачунарски (софтверски) алати

- *Mathematica*, WolframAlpha, MuPAD, Maxima, SymPy, SymPy Live, SymPy Gamma
- MATLAB, Scilab, Octave, FreeMat, Julia
- LTspice, QucsStudio, ngspice, Xyce, XCircuit
- Python, MathCAD, MAPLE, GeoGebra
- Symbolab, SpeQ Mathematics, meta-calculator, Desmos, ...

Free/Libre Open Source Software (FLOSS)

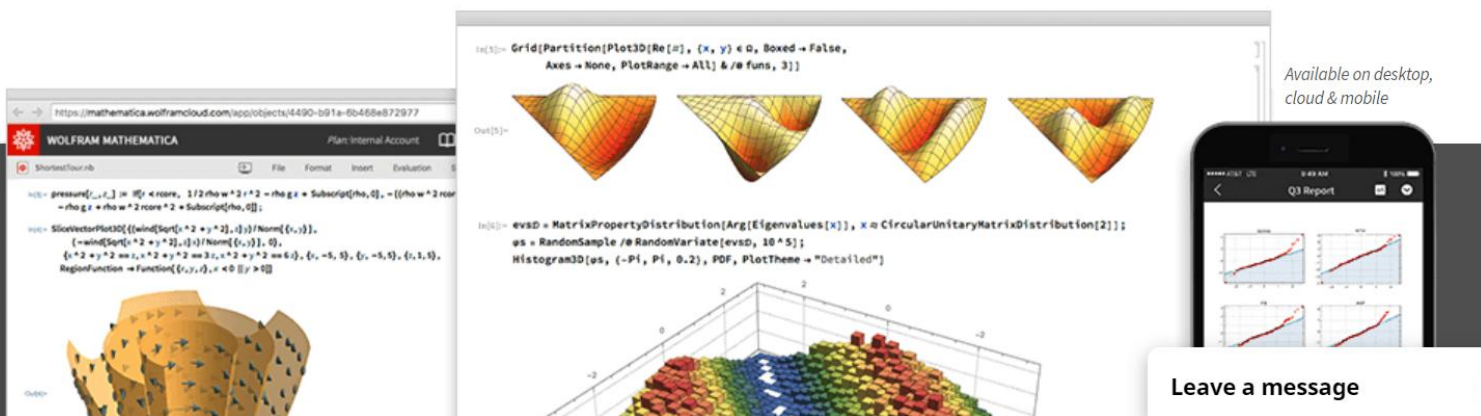
Mathematica

<https://www.wolfram.com/mathematica/>



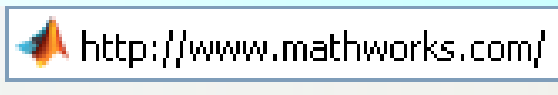
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MATLAB



MathWorks - Makers of MATLAB

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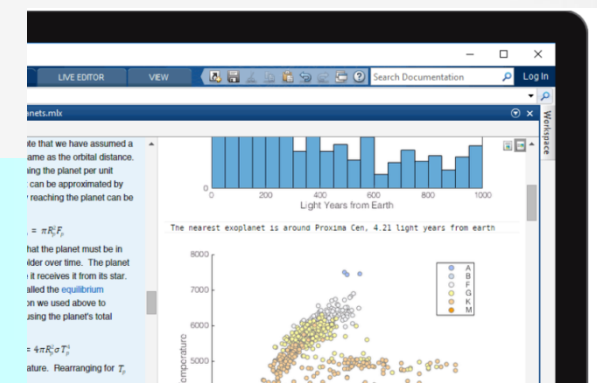
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MATLAB® combines a desktop environment tuned for iterative analysis and design processes with a programming language that expresses matrix and array mathematics directly. It includes the [Live Editor](#) for creating scripts that combine code, output, and formatted text in an executable notebook.

Design AI models and AI-driven systems



Products by Category Alphabetical

MATLAB® PRODUCT FAMILY

MATLAB

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Parallel Computing Toolbox
MATLAB Parallel Server

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Curve Fitting Toolbox
Optimization Toolbox
Global Optimization Toolbox
Symbolic Math Toolbox
Mapping Toolbox

SIMULINK® PRODUCT FAMILY

Simulink

System Composer

Event-Based Modeling

Stateflow
SimEvents

Physical Modeling

Simscape
Simscape Driveline
Simscape Electrical
Simscape Fluids

SERVICES

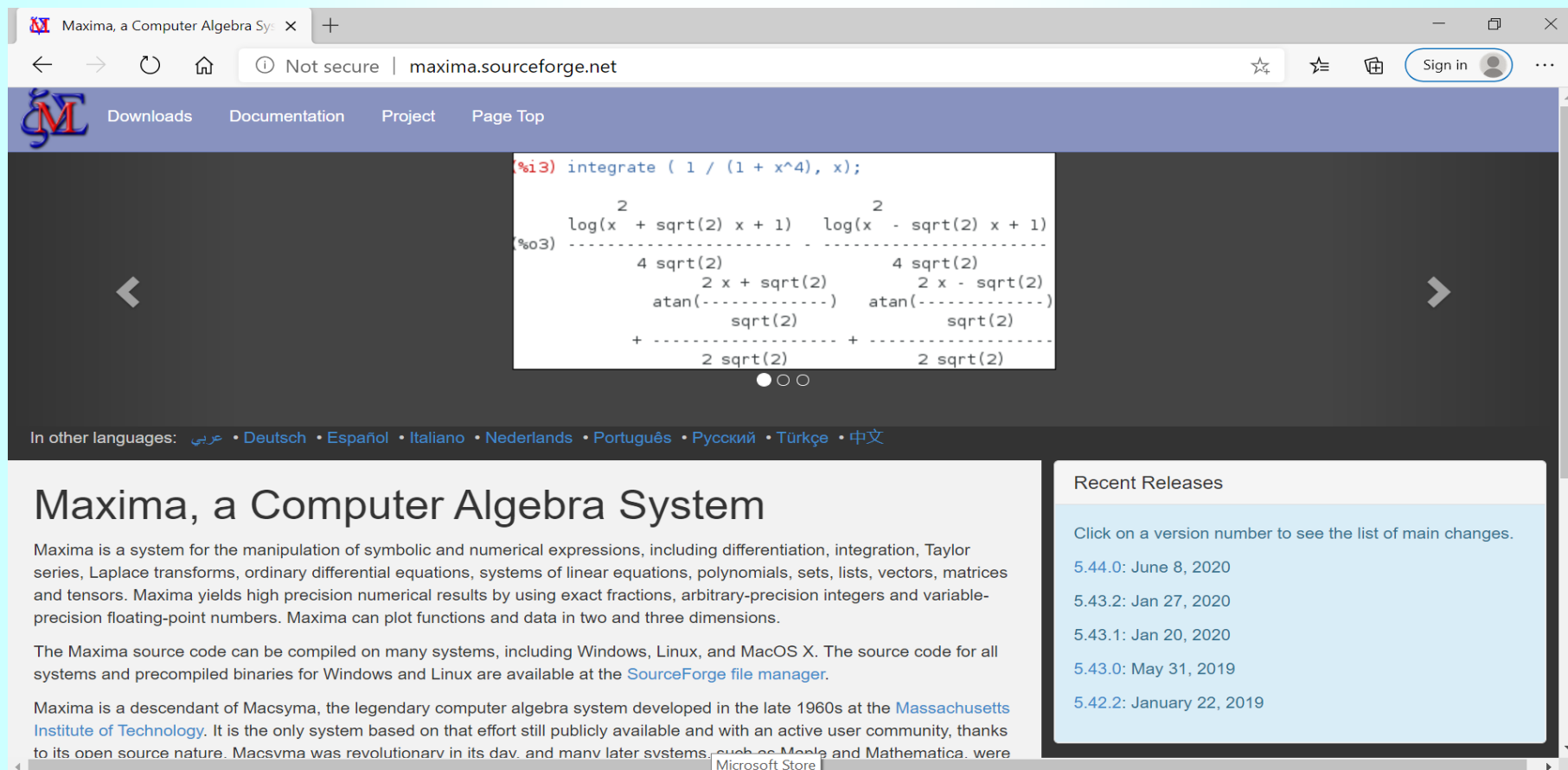
Software Maintenance
Training
Consulting

LICENSE TYPES

Industry Use
Student Use
University Use
Startup Use
Primary and Secondary School Use
Home Use

Maxima

<http://maxima.sourceforge.net/>



The screenshot shows the Maxima website interface. At the top, there's a navigation bar with links: Downloads, Documentation, Project, and Page Top. Below this, a large white box displays a complex mathematical result for the integral of $1/(1+x^4)$. The result is a sum of logarithmic and arctangent terms, symmetrically structured. Below the result, there are three small circles, with the first one filled, indicating the current page. At the bottom of the page, there's a section titled "Maxima, a Computer Algebra System" with a paragraph describing its capabilities. To the right, a "Recent Releases" section lists several versions with their release dates. The website is styled with a dark blue header and a light blue background for the content area.

Maxima, a Computer Algebra System

Maxima is a system for the manipulation of symbolic and numerical expressions, including differentiation, integration, Taylor series, Laplace transforms, ordinary differential equations, systems of linear equations, polynomials, sets, lists, vectors, matrices and tensors. Maxima yields high precision numerical results by using exact fractions, arbitrary-precision integers and variable-precision floating-point numbers. Maxima can plot functions and data in two and three dimensions.

The Maxima source code can be compiled on many systems, including Windows, Linux, and MacOS X. The source code for all systems and precompiled binaries for Windows and Linux are available at the [SourceForge file manager](#).

Maxima is a descendant of Macsyma, the legendary computer algebra system developed in the late 1960s at the [Massachusetts Institute of Technology](#). It is the only system based on that effort still publicly available and with an active user community, thanks to its open source nature. Macsyma was revolutionary in its day, and many later systems, such as Maple and Mathematica, were

Recent Releases

Click on a version number to see the list of main changes.

- [5.44.0](#): June 8, 2020
- [5.43.2](#): Jan 27, 2020
- [5.43.1](#): Jan 20, 2020
- [5.43.0](#): May 31, 2019
- [5.42.2](#): January 22, 2019

Maxima on line

<http://maxima.cesga.es/>

Servicio proporcionado por  CESGA

Maxima on line

Help: [Español](#), [English](#), [Galego](#)

```
expand((x-2)^3*(x+1/3)^2);  
  
solve(x^2-x+2=0);  
  
invert(matrix([2,3,1], [a,0,0], [1,4,8]));  
  
integrate(x * sin(x), x);  
  
draw3d(explicit(x^2+y^2,x,-1,1,y,-1,1));
```

[Clic](#) [Clear](#)

[AVISO LEGAL](#)

```
(%i1) expand((x-2)^3*(x+1/3)^2);
```

(%o1)
$$x^5 - \frac{16x^4}{3} + \frac{73x^3}{9} - \frac{2x^2}{3} - 4x - \frac{8}{9}$$

```
(%i2) solve(x^2-x+2=0);
```

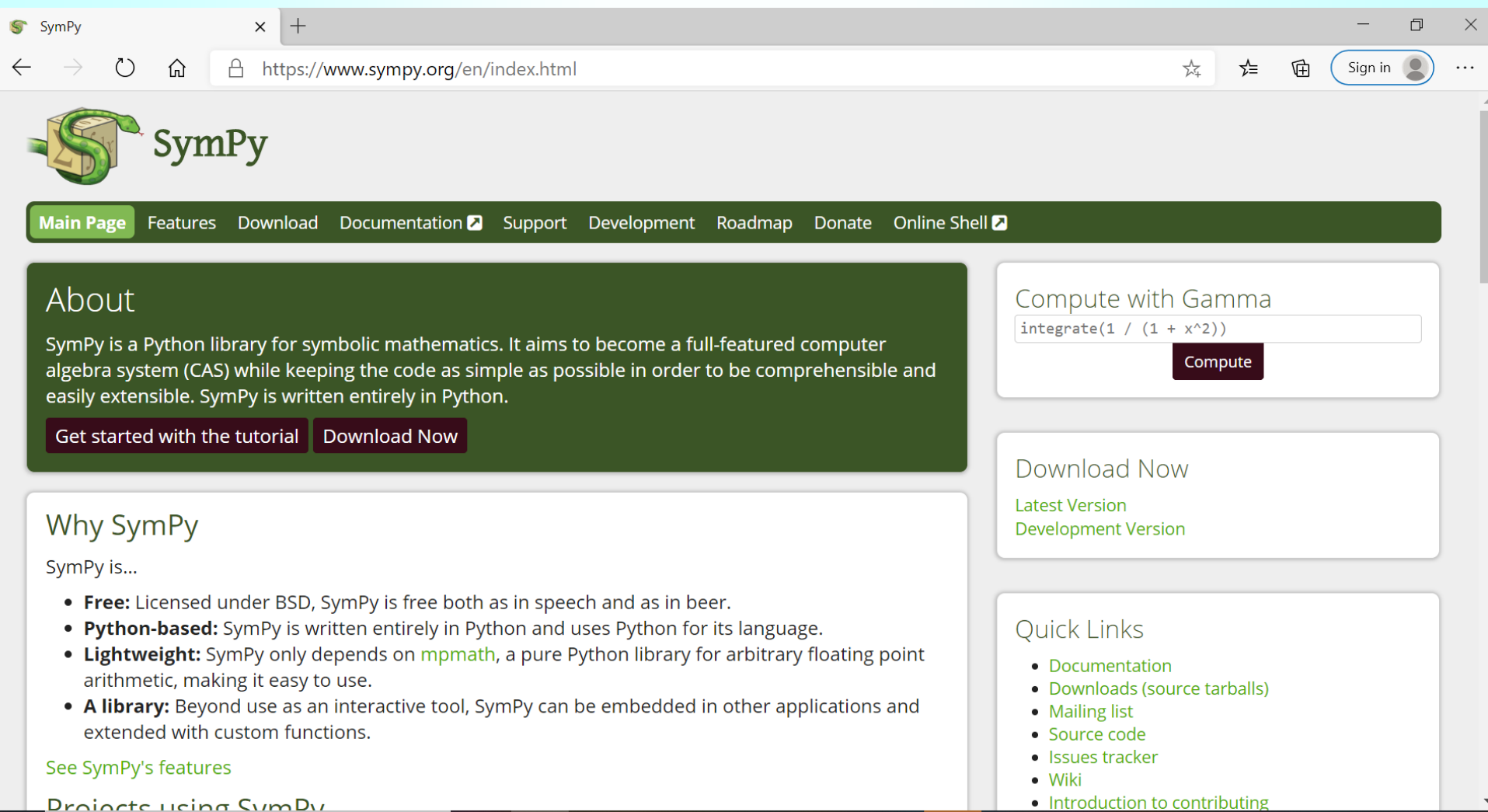
(%o2)
$$\left[x = -\frac{\sqrt{7}i-1}{2}, x = \frac{\sqrt{7}i+1}{2} \right]$$

```
(%i3) invert(matrix([2,3,1], [a,0,0], [1,4,8]));
```

(%o3)
$$\begin{pmatrix} 0 & \frac{1}{a} & 0 \\ \frac{2}{5} & -\frac{3}{4a} & -\frac{1}{20} \\ -\frac{1}{5} & \frac{1}{4a} & \frac{3}{20} \end{pmatrix}$$

SymPy

www.sympy.org/



The screenshot shows the SymPy website homepage. At the top, there's a navigation bar with links: Main Page, Features, Download, Documentation, Support, Development, Roadmap, Donate, and Online Shell. The main content area is divided into several sections. On the left, there's an 'About' section with a description of SymPy as a Python library for symbolic mathematics. Below it, there's a 'Why SymPy' section. On the right, there's a 'Compute with Gamma' section with a text input field containing the expression $\int \frac{1}{1+x^2} dx$ and a 'Compute' button. Below that, there's a 'Download Now' section with links for 'Latest Version' and 'Development Version'. At the bottom right, there's a 'Quick Links' section with links to Documentation, Downloads, Mailing list, Source code, Issues tracker, Wiki, and Introduction to contributing.

SymPy

https://www.sympy.org/en/index.html

Sign in

Main Page Features Download Documentation Support Development Roadmap Donate Online Shell

About

SymPy is a Python library for symbolic mathematics. It aims to become a full-featured computer algebra system (CAS) while keeping the code as simple as possible in order to be comprehensible and easily extensible. SymPy is written entirely in Python.

[Get started with the tutorial](#) [Download Now](#)

Why SymPy

SymPy is...

- **Free:** Licensed under BSD, SymPy is free both as in speech and as in beer.
- **Python-based:** SymPy is written entirely in Python and uses Python for its language.
- **Lightweight:** SymPy only depends on `mpmath`, a pure Python library for arbitrary floating point arithmetic, making it easy to use.
- **A library:** Beyond use as an interactive tool, SymPy can be embedded in other applications and extended with custom functions.

[See SymPy's features](#)

Projects using SymPy

Compute with Gamma

`integrate(1 / (1 + x^2))`

[Compute](#)

Download Now

[Latest Version](#)
[Development Version](#)

Quick Links

- [Documentation](#)
- [Downloads \(source tarballs\)](#)
- [Mailing list](#)
- [Source code](#)
- [Issues tracker](#)
- [Wiki](#)
- [Introduction to contributing](#)

SymPy live

live.sympy.org

live.sympy.org



Main Page Download Documentation Support Development Donate **Online Shell**

These commands were executed:

```
>>> from __future__ import division
>>> from sympy import *
>>> x, y, z, t = symbols('x y z t')
>>> k, m, n = symbols('k m n', integer=True)
>>> f, g, h = symbols('f g h', cls=Function)
```

Documentation can be found at <http://docs.sympy.org/>.

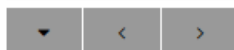
```
>>> diffeq = Eq(f(x).diff(x) + 1000*f(x), 10000)
>>> diffeq
```

$$1000f(x) + \frac{d}{dx} f(x) = 10000$$

```
>>> dsolve(diffeq, f(x))
```

$$f(x) = C_1 e^{-1000x} + 10$$

```
>>>
```



Evaluate

Clear

Fullscreen

Log In

About this page

SymPy Live is SymPy running on the SymPy Engine.

This is just a regular Python shell with the following commands executed:

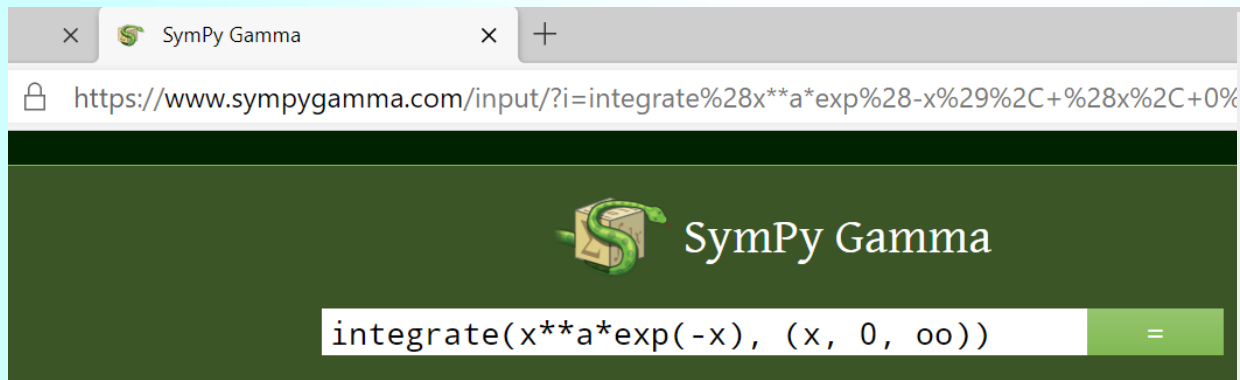
```
>>> from __future__ import division
>>> from sympy import *
>>> x, y, z, t = symbols('x y z t')
>>> k, m, n = symbols('k m n', integer=True)
>>> f, g, h = symbols('f g h', cls=Function)
```

Please note that the Google App Engine has a timeout of 60 seconds for computation due to a quirk in Safari on iOS, which is 58 seconds.

The thumbtack icon is from the [Bar Icon Pack](#) and is used under a Creative Commons license. You may use the materials in this file for non-commercial purposes without restriction to develop your application.

SymPy Gamma

<https://www.sympygamma.com/>



SymPy:

`integrate (x**a*exp (-x),(x,0,oo ))`

$$\int_0^{\infty} x^a e^{-x} dx$$

Antiderivative forms:

`integrate(x**a*exp(-x), (x, 0, oo))`

$$\begin{cases} \Gamma(a+1) & \text{for } \operatorname{re}(a) > -1 \\ \int_0^{\infty} x^a e^{-x} dx & \text{otherwise} \end{cases}$$

`sympy.integrals.manualintegrate(x**a*exp(-x), (x, 0, oo))`

$$-\Gamma(a+1, x)$$

Examples

Random Example

Arithmetic

Algebra

Trigonometry

Calculus

Number Theory

Discrete Mathematics

Plotting

Miscellaneous

www.wolframalpha.com

Give your brain a quick workout with Wolfram Problem Generator.



$y' + 1000 * y = 10000, y(0) = -10$



Examples Random

Input:

$$\{y'(x) + 1000 y(x) = 10\,000, y(0) = -10\}$$

ODE classification:

first-order linear ordinary differential equation

Alternate forms:

$$\{y'(x) = 10\,000 - 1000 y(x), y(0) = -10\}$$

$$\{y'(x) + 1000 (y(x) - 10) = 0, y(0) = -10\}$$

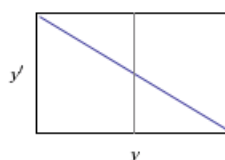
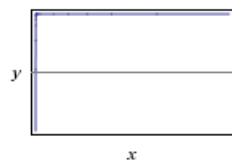
Differential equation solution:

Approximate form

Step-by-step solution

$$y(x) = 10 - 20 e^{-1000 x}$$

Plots of the solution:



New to
Wolfram|Alpha?



Take the Tour >>

New!
Wolfram Problem
Generator

Need a hint?

Google kalkulator



$x \cdot \sin(x)$



Све

Сlike

Видео

Мапе

Вести

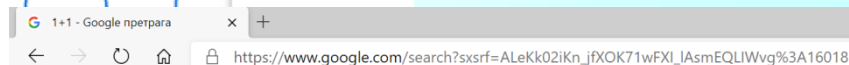
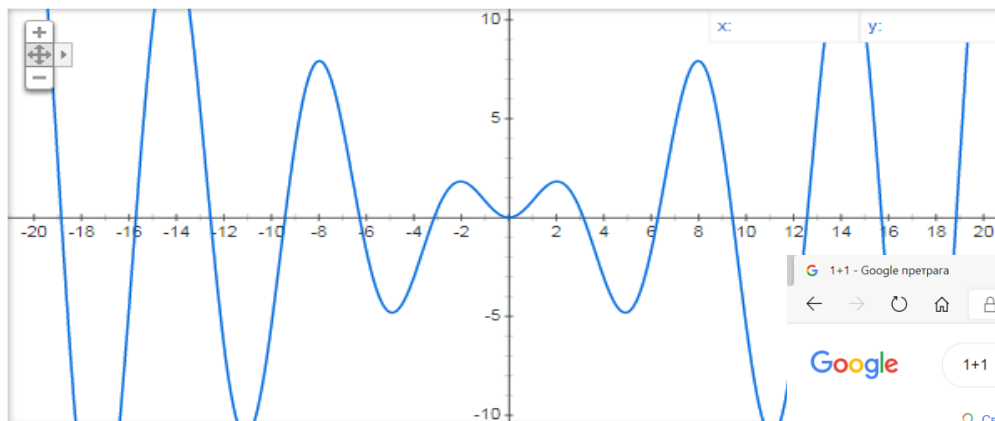
Још

Подешавања

Алатке

Око 3.640.000.000 резултата (0,57 секунде/и)

Графикон за $x \cdot \sin(x)$



1+1

Све

Сlike

Мапе

Видео

Вести

Још

Подешавања

Алатке

Око 25.270.000.000 резултата (0,72 секунде/и)

www.mytutor.co.uk > Maths > Преведи ову страницу

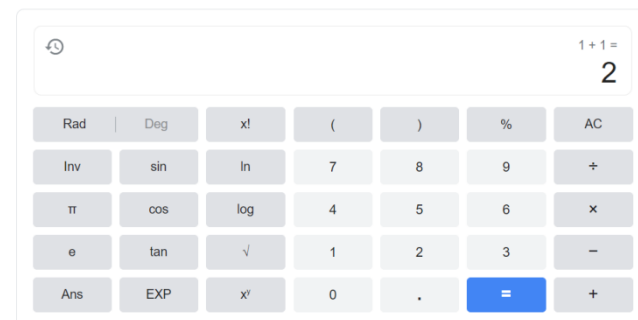
What is the integral of $x \sin(x) dx$? | MyTutor

Find the following integral: $\int x \sin(x) dx$ This question is a good candidate for parts method, as it is the product of two different 'parts'. R...

www.teachoo.com > category > Преведи ову страницу

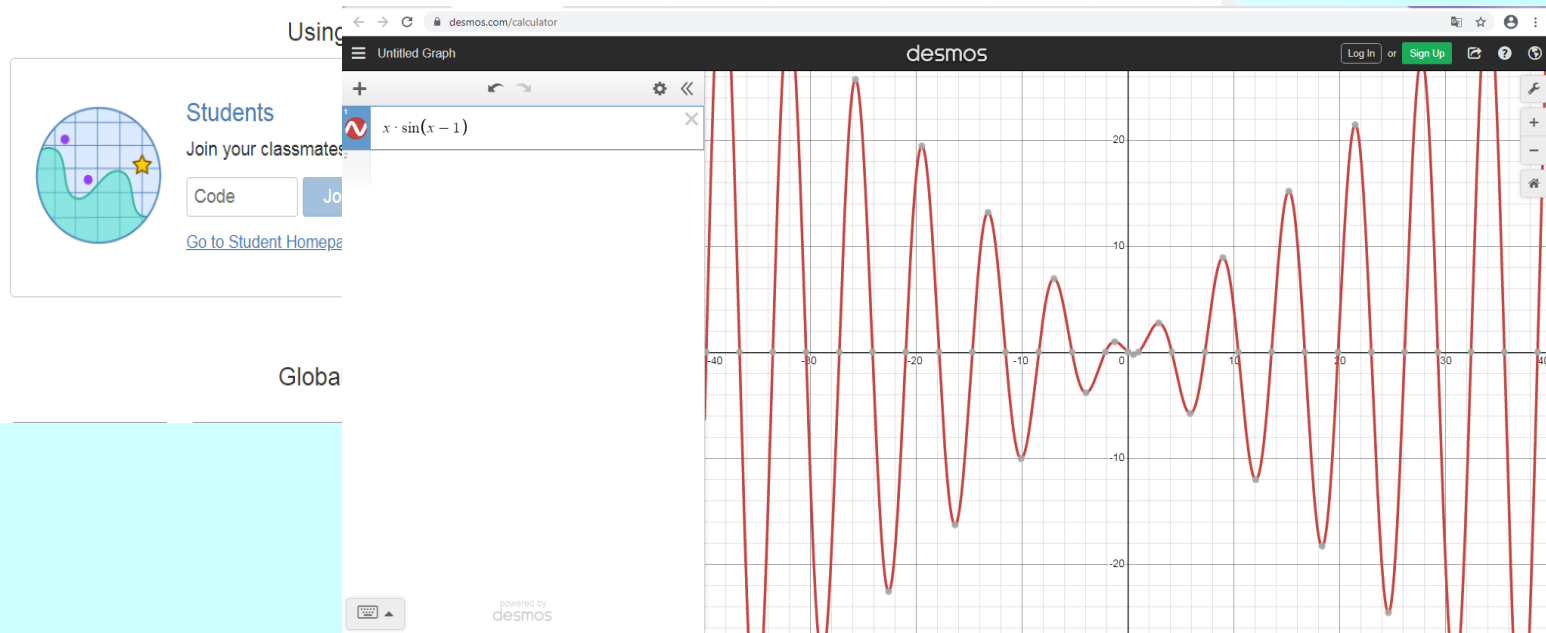
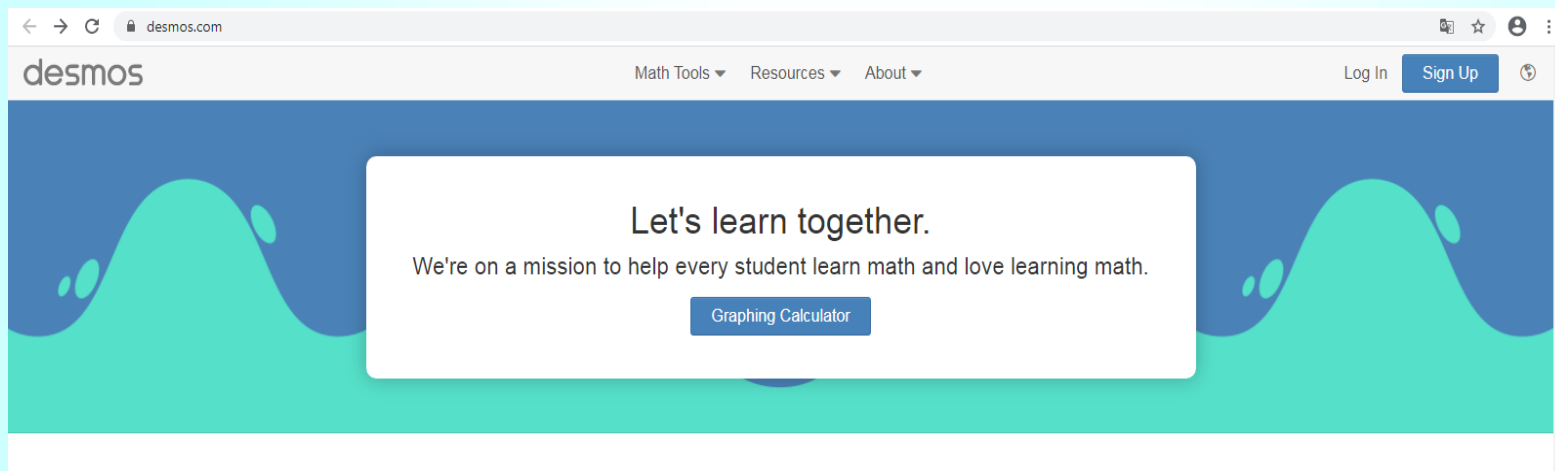
Ex 7.6, 1 - Find integration of $x \sin x$ - Chapter 7 Clas

25.09.2018. - Ex 7.6, $1x \sin x \int 1 \cdot [x \sin x] dx$ | Algebraic Trigonometric V
 $g(x) \int dx = f(x) \int 1 \cdot g(x) \dots$



Graphing Calculator – Desmos

<https://www.desmos.com/calculator>



Symbolab Math Solver - Step by Step calculator

<https://www.symbolab.com/>

Try our new Geometry solver! [Got it](#)

Formatting tips »

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simplify solve for inverse tangent line See All

Step-by-Step Calculator Solve problems from Pre Algebra to Calculus step-by-step

Solution [Keep Practicing >](#)

[Show Steps](#)

$\int_0^T x \sin(x) dx = \sin(T) - T \cos(T)$

Steps

$\int_0^T x \sin(x) dx$

Apply Integration By Parts: $u = x, v' = \sin(x)$ [Show Steps](#)

$= [-x \cos(x) - \int -\cos(x) dx]_0^T$

$\int -\cos(x) dx = -\sin(x)$ [Show Steps](#)

$= [-x \cos(x) - (-\sin(x))]_0^T$

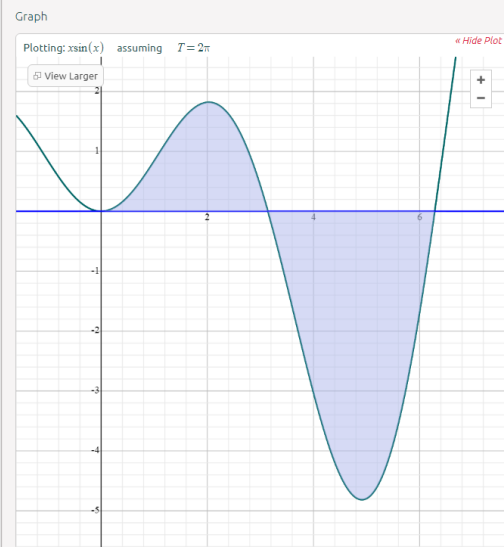
Simplify

$= [-x \cos(x) + \sin(x)]_0^T$

Compute the boundaries: $[-x \cos(x) + \sin(x)]_0^T = \sin(T) - T \cos(T)$ [Show Steps](#)

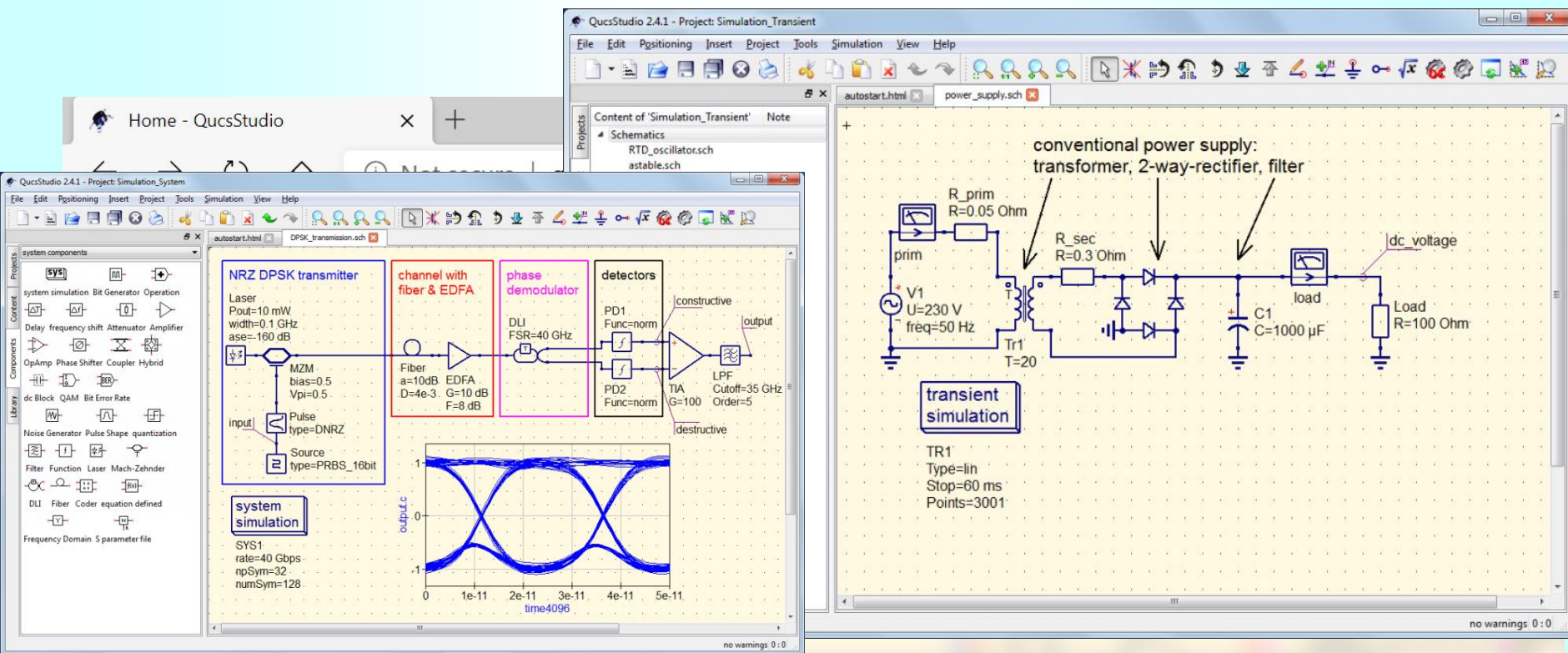
$= \sin(T) - T \cos(T)$

[Got a different answer? Check if it's correct](#) [Verify](#)



QucsStudio

<http://qucsstudio.de/>

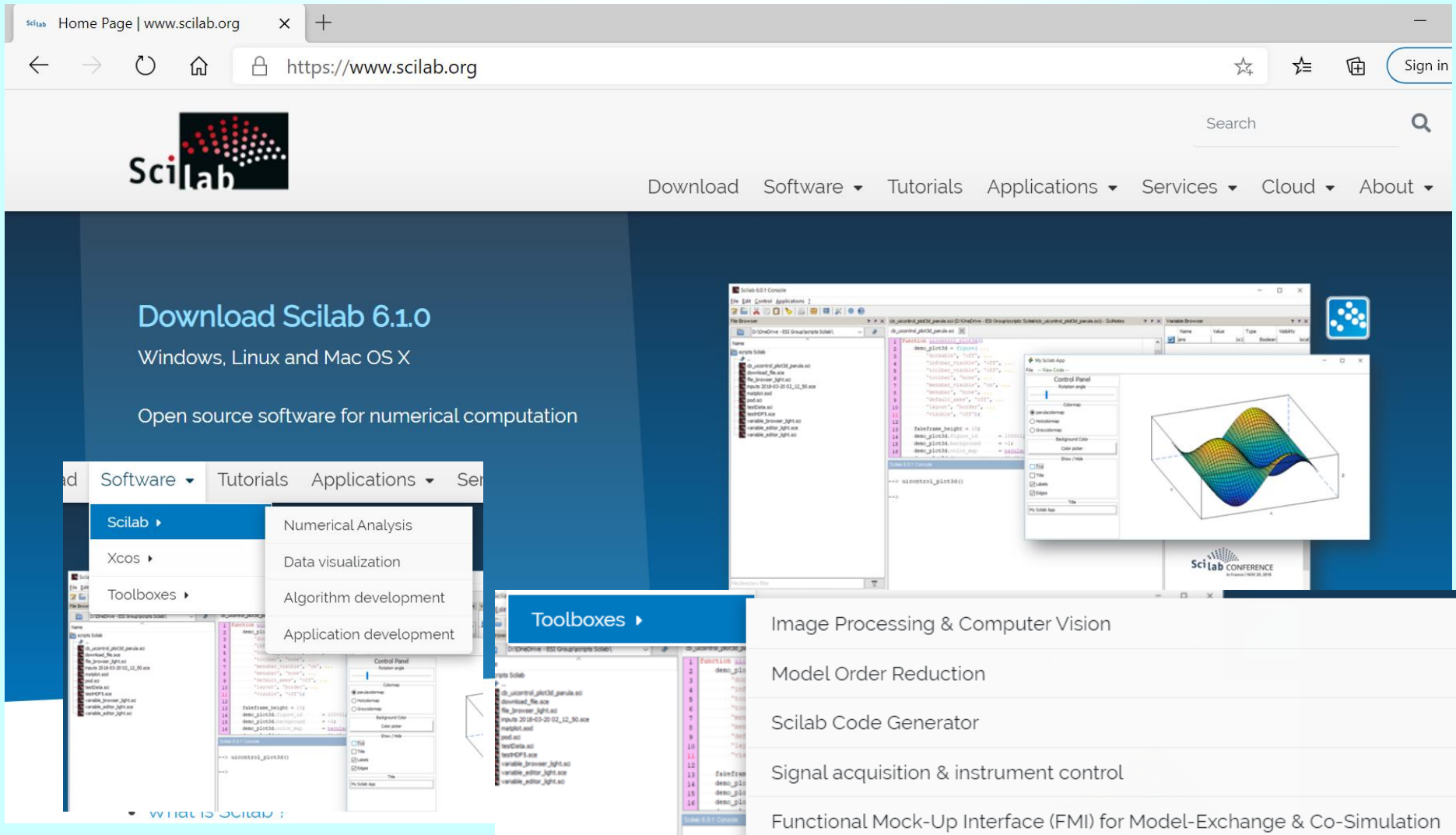


QucsStudio

a free and powerful circuit simulator

SciLab

<https://www.scilab.org/>



Xcos

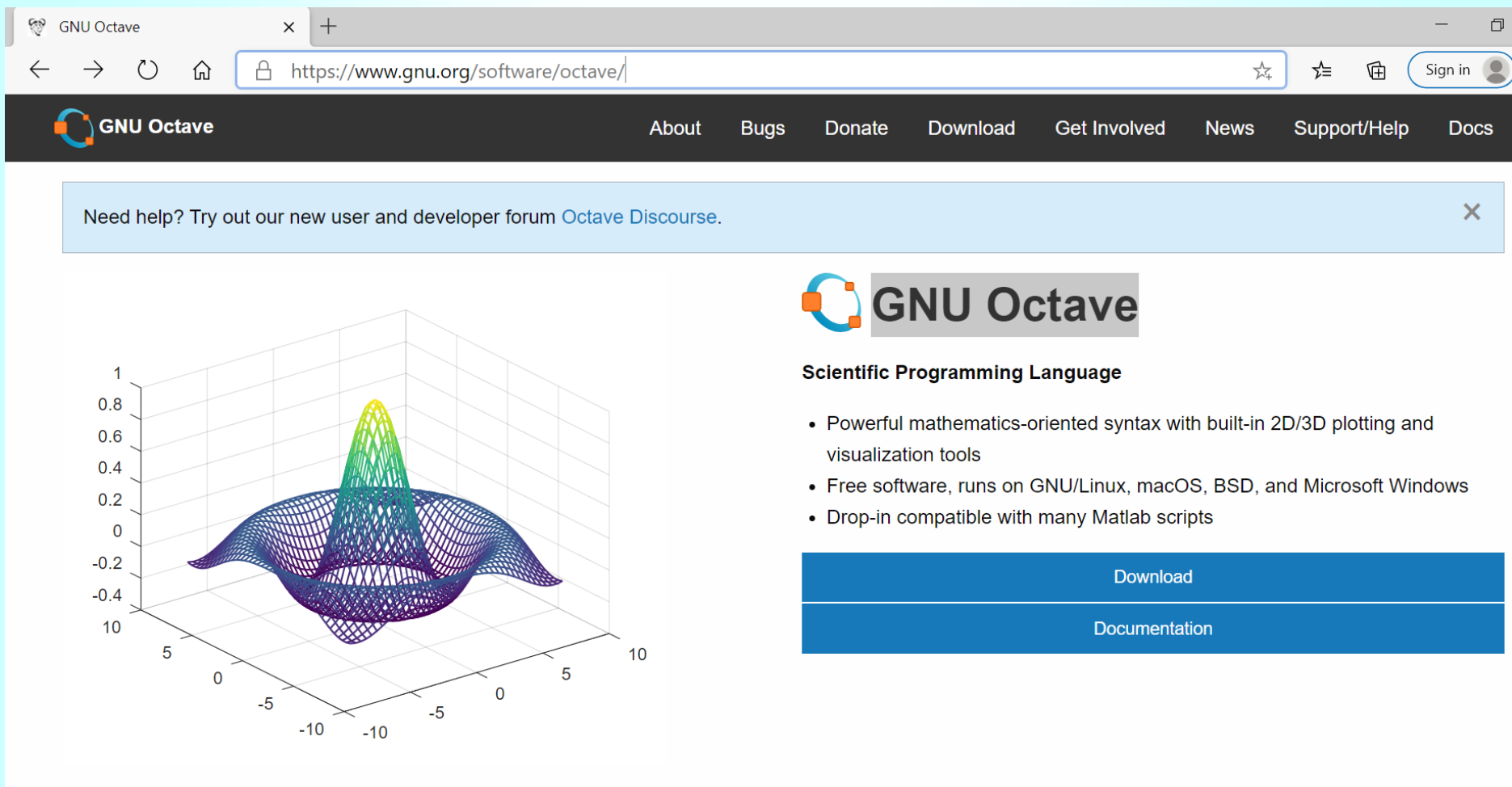
<https://www.scilab.org/software/xcos>

The screenshot displays the Xcos website interface. At the top, the Scilab logo is on the left, and a navigation menu includes 'Download', 'Software', 'Tutorials', 'Applications', 'Services', 'Cloud', and 'About'. A search bar is located on the right. Below the navigation bar, the word 'Xcos' is prominently displayed in the center. At the bottom, four example diagrams are shown, each representing a different application area:

- Signal Processing:** A diagram showing three 'Signal Builder' blocks connected to a 'Scope' block. A note below states: 'blocks can also emit continuous or discrete activation signals'.
- Control Systems:** A diagram titled 'Water-Tank System' showing a feedback control loop with a 'Controller' block and a 'Robot-Tank System' block.
- Mechanics/Thermodynamics:** A diagram showing a series of interconnected mechanical or thermal components, including valves and tanks.
- Electronics:** A diagram showing an electronic circuit with various components like resistors, capacitors, and a 'MUX' block.

GNU Octave

<https://www.gnu.org/software/octave/>

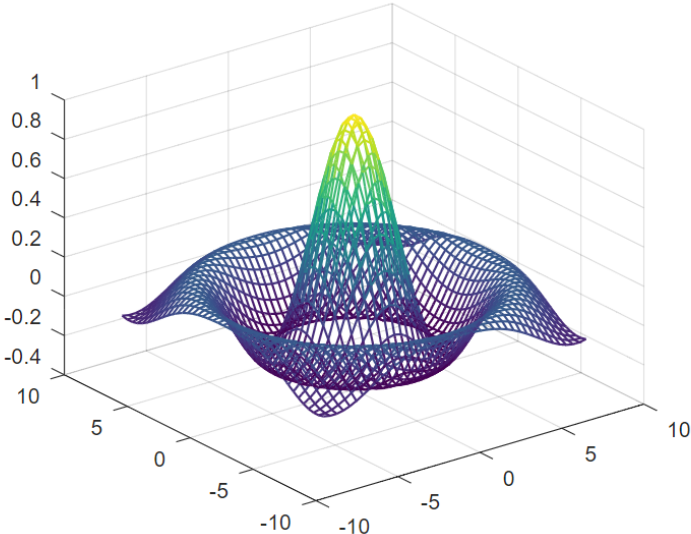


The screenshot shows the GNU Octave website homepage. At the top, there's a browser window with the address bar showing <https://www.gnu.org/software/octave/>. Below the browser window is a dark navigation bar with the GNU Octave logo on the left and links for About, Bugs, Donate, Download, Get Involved, News, Support/Help, and Docs on the right. A light blue banner below the navigation bar contains the text "Need help? Try out our new user and developer forum [Octave Discourse](#)." with a close button. The main content area features a 3D wireframe plot of a function on the left, which is a bell-shaped curve with a central peak and surrounding ripples. To the right of the plot is the GNU Octave logo and the text "Scientific Programming Language". Below this, there is a list of bullet points describing the language's features. At the bottom right, there are two blue buttons: "Download" and "Documentation".

GNU Octave

About Bugs Donate Download Get Involved News Support/Help Docs

Need help? Try out our new user and developer forum [Octave Discourse](#).



GNU Octave

Scientific Programming Language

- Powerful mathematics-oriented syntax with built-in 2D/3D plotting and visualization tools
- Free software, runs on GNU/Linux, macOS, BSD, and Microsoft Windows
- Drop-in compatible with many Matlab scripts

Download

Documentation

CircuitLab

<https://www.circuitlab.com/>

The image shows a screenshot of the CircuitLab website and a circuit simulation interface. The website header includes the CircuitLab logo, a search bar, and user information for 'milka.potrebic'. The main heading is 'Circuit simulation and schematics.' followed by the subheading 'Build and simulate circuits right in your browser.' A list of features is provided: 'Design with our easy-to-use schematic editor.', 'Analog & digital circuit simulations in seconds.', 'Professional schematic PDFs, wiring diagrams, and plots.', and 'No installation required! Launch it instantly with one click.' A green button labeled 'Launch CircuitLab' is present, along with a link to 'or watch a quick demo video →'. Below this, a video player titled 'Getting Started with CircuitLab' shows a circuit diagram with a sine wave source V1 (1 kHz), a resistor R1 (100 Ω), a resistor R2 (100 Ω), and a capacitor C1 (1 μF). The video player has a play button and a progress bar. Below the video player, a circuit diagram is shown with a sine wave source V1 (1 kHz), a resistor R1 (100 Ω), and a capacitor C1 (10 μF). The circuit is connected to a ground symbol. A '1-minute Tutorial' is provided with the following steps: 1. Click and drag a wire from the right of R1 to the top of C1. 2. Click "Simulate." 3. Click "Run Time-domain Simulation" and look at the filter output V(out) 4. Double-click R1, change it to "1k", and simulate again. 5. Run the Frequency-Domain simulation and see the Bode plot. The bottom of the image shows the CircuitLab interface with a search bar, a list of components (DC Sources, Passive Elements, Voltage Signal Sources, Current Signal Sources, Operational Amplifiers, Diodes), and a circuit diagram with a sine wave source V1 (1 kHz), a resistor R1 (100 Ω), and a capacitor C1 (10 μF). The circuit is connected to a ground symbol. The bottom of the image shows the CircuitLab interface with a search bar, a list of components (DC Sources, Passive Elements, Voltage Signal Sources, Current Signal Sources, Operational Amplifiers, Diodes), and a circuit diagram with a sine wave source V1 (1 kHz), a resistor R1 (100 Ω), and a capacitor C1 (10 μF). The circuit is connected to a ground symbol.

CircuitLab

Search

milka.potrebic
inbox (0) · settings · log out

Circuit simulation and schematics.

Build and simulate circuits right in your browser.

- Design with our easy-to-use schematic editor.
- Analog & digital circuit simulations in seconds.
- Professional schematic PDFs, wiring diagrams, and plots.
- No installation required! Launch it instantly with [one click](#).

▶ Launch CircuitLab

[or watch a quick demo video →](#)

Getting Started with CircuitLab

Гледајте К... Дели

V1 sine 1 KHz

R2 100 Ω

R1 100 Ω

C1 1 μF

1-minute Tutorial

1. Click and drag a wire from the right of R1 to the top of C1.
2. Click "Simulate."
3. Click "Run Time-domain Simulation" and look at the filter output V(out)
4. Double-click R1, change it to "1k", and simulate again.
5. Run the Frequency-Domain simulation and see the Bode plot.

Electronic systems with CircuitLab's free, ik.

[Circuit Design and Analysis](#)

Powered by CircuitLab - to learn about the full version, please visit www.circuitlab.com/

DoCircuits Circuit Simulator

Do Circuits

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Experience virtual labs for electronics on browser. Work with real looking components and devices. Build circuits - run, analyse and save them in easy steps.
Reach us at info@docircuits.com

Launch Online Labs

Download Free Trial



Get started with some sample circuits !

Colpitts Oscillator

This circuit generates a continuous sinusoidal signal. The tank circuit is made up of two capacitors and an inductor in parallel

Active Low Pass Filter

This circuit made up using op-amp and will allow signals lower than a particular cut off frequency to pass though and attenuates those above it.

Active High Pass Filter

This circuit uses an op-amp as the active element and allows only the input signals with frequency higher than the cut-off frequency and rejects those below it.

Clipper

This is a wave-shaping circuit. It will modify the shape of the signal by "clipping" off a portion of it. When the diode is forward-biased, the voltage across it will be a constant 0.7 V. And when the diode is reverse-biased, it will be open. Thus the output will follow the input when it is forward biased.

Clamper

This circuit is another level shape. The wave is shifted to a positive or negative level.

Fig. 1: DoCircuits - Home



MATLAB

 <http://www.mathworks.com/>

MATLAB R2019a

HOME

PLOTS

APPS

New Script

New Live Script

New

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Find Files

Compare

Import Data

Save Workspace

New Variable

Open Variable

Clear Workspace

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Simulink

Layout

Preferences

Set Path

Parallel

Add-Ons

Help

Community

Request Support

Learn MATLAB

FILE

VARIABLE

CODE

SIMULINK

ENVIRONMENT

RESOURCES

C:\Program Files\Polyspace\R2019a\bin

Current Folder

Name

m3iregistry

registry

util

win

win

cr

de

lcc

lcc

lcc

ma

mt

mc

me

me

mv

wo

Command Window

New to MATLAB? See resources for [Getting Started.](#)

fx

>>

Workspace

Name

Value

System target file browser: Simulink2DSHplus

System target file:

ASAP2.tlc

dsh.tlc

dsh.tlc

ert.tlc

ert.tlc

ert.tlc

ert.tlc

ert.tlc

ert.tlc

Full name:

Template makefile

Makefile

Cancel

Help

Apply

Description:

ASAP-ASAP2 Data Definition Target

Borland C++ DSHplus Real-Time Target with

Visual C/C++ DSHplus Real-Time Target with

RTW Embedded Coder (no auto configuration)

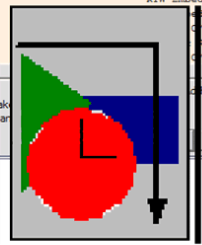
RTW Embedded Coder (auto configures for C)

C++ Project Makefile only for the

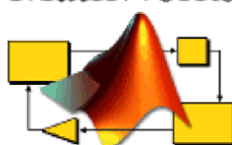
real-time target

C++ Project Makefile only for the

Simulink2D SHplus



MathWorks



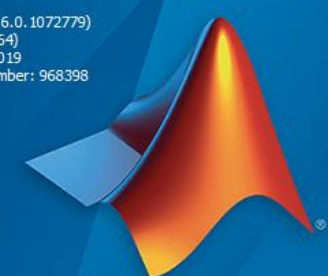
Toolboxes...

R2019a (9.6.0.1072779)

64-bit (win64)

March 8, 2019

License Number: 968398



MATLAB®

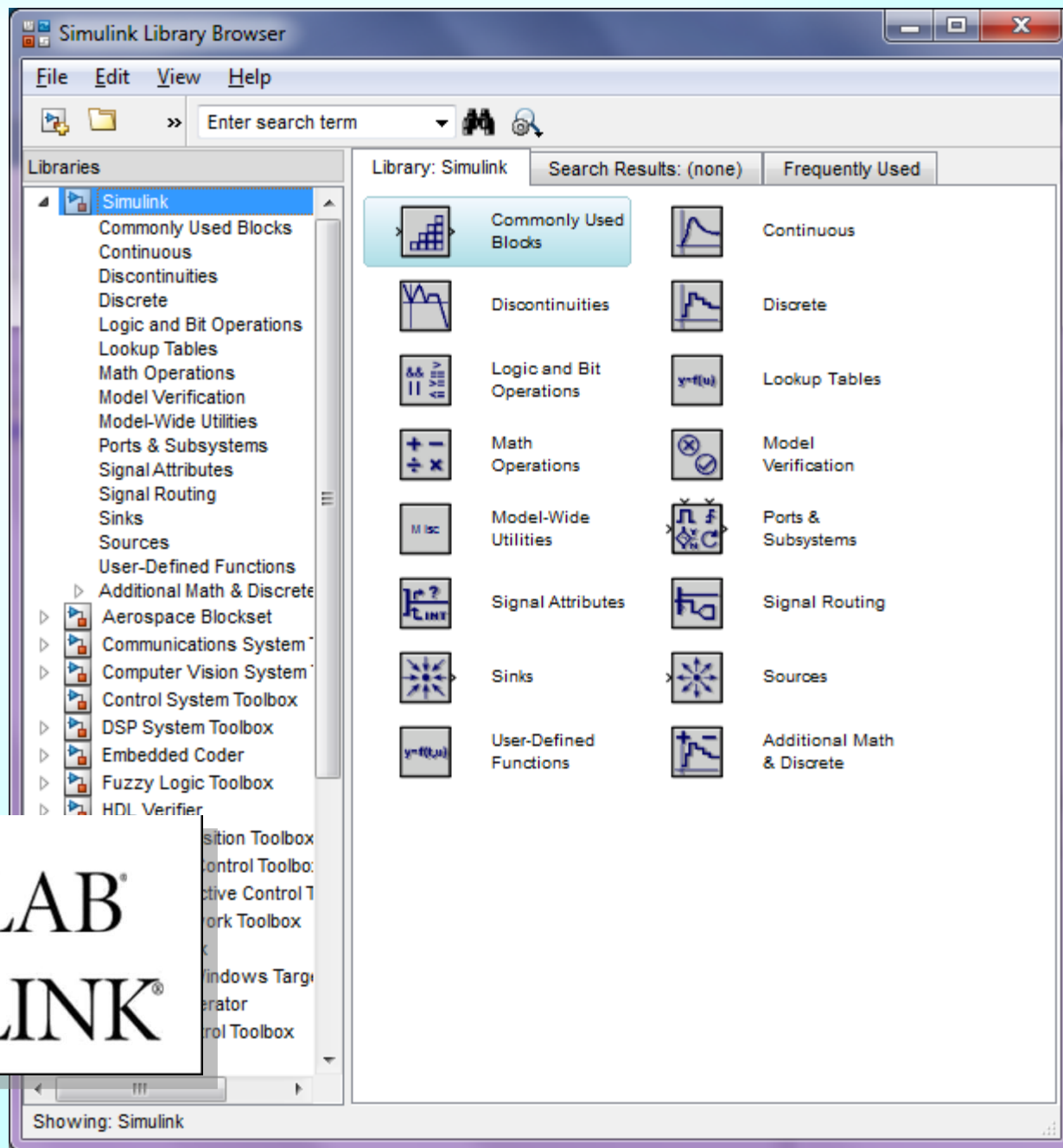
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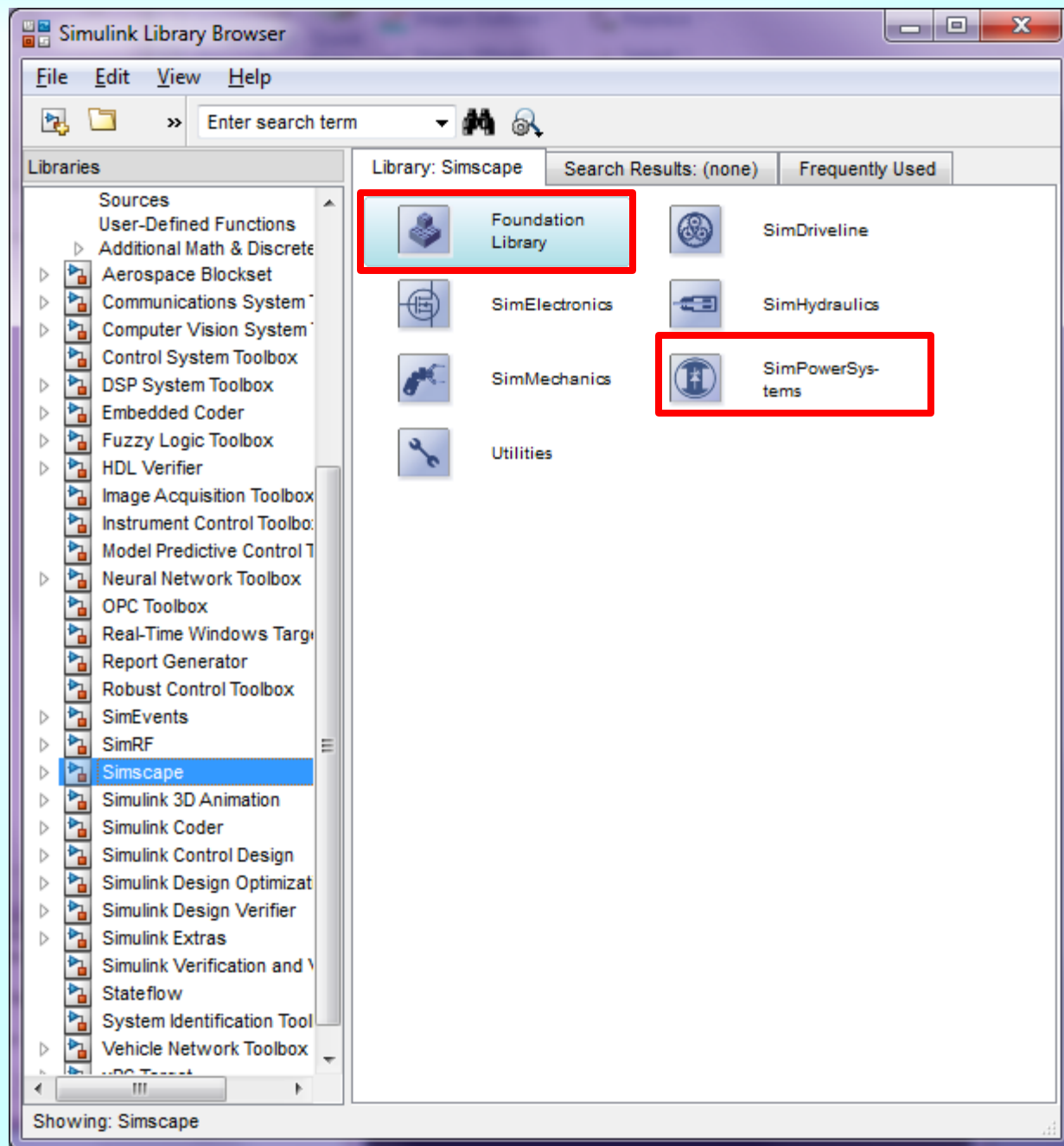
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R2019a

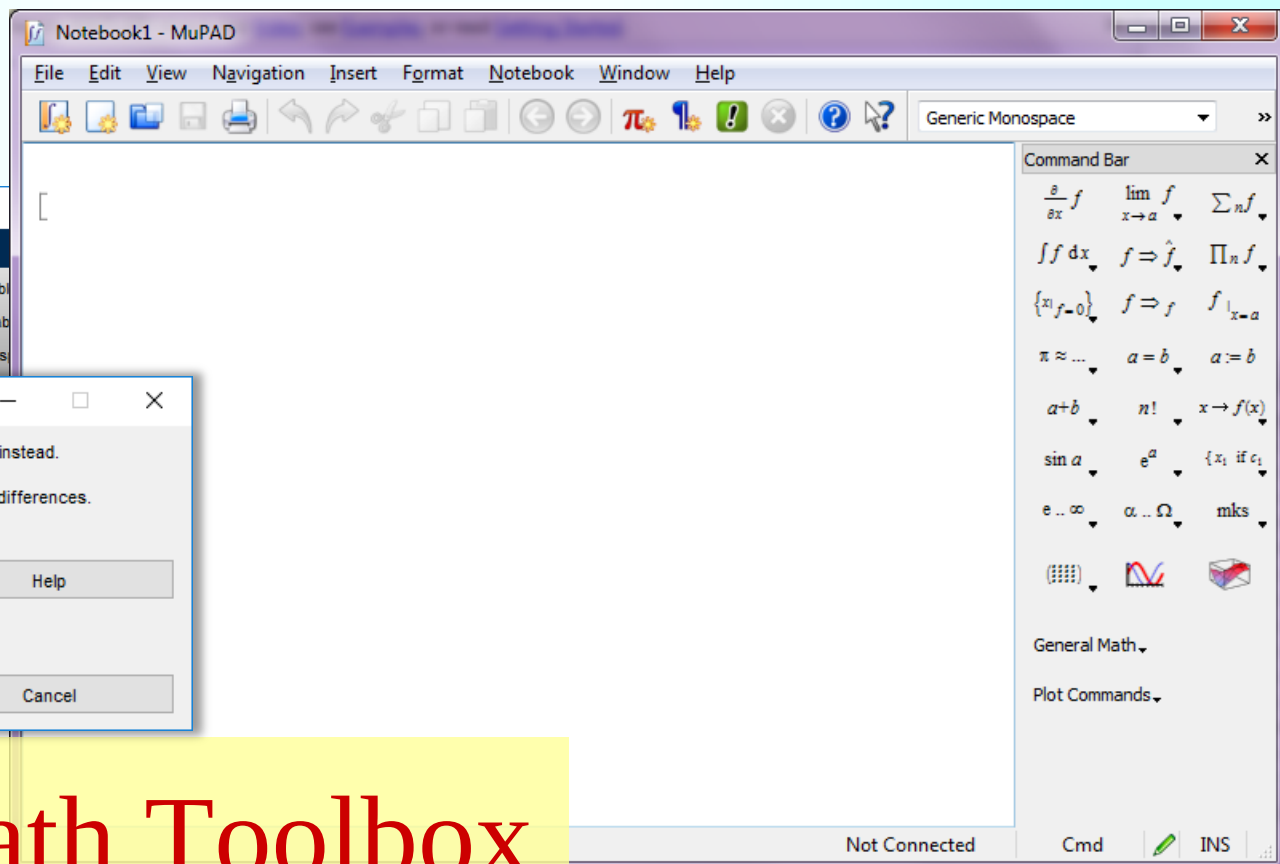
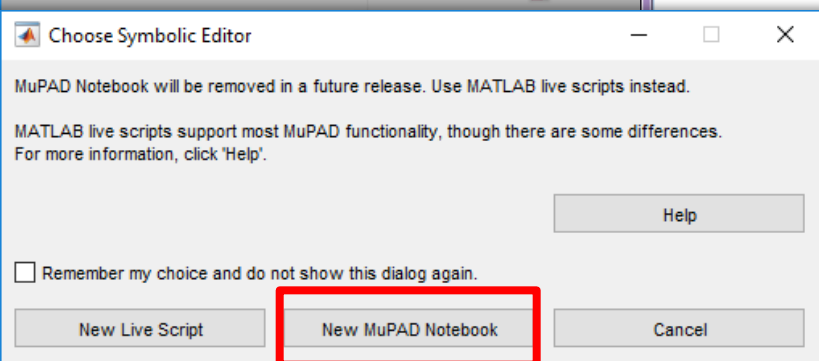
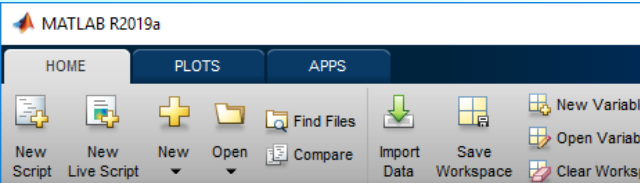
Simulink



Simscape



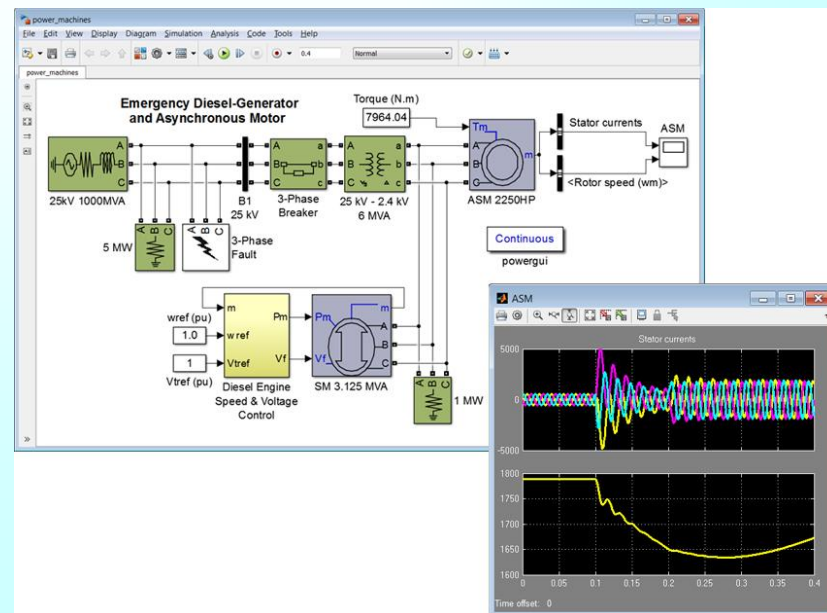
MuPAD

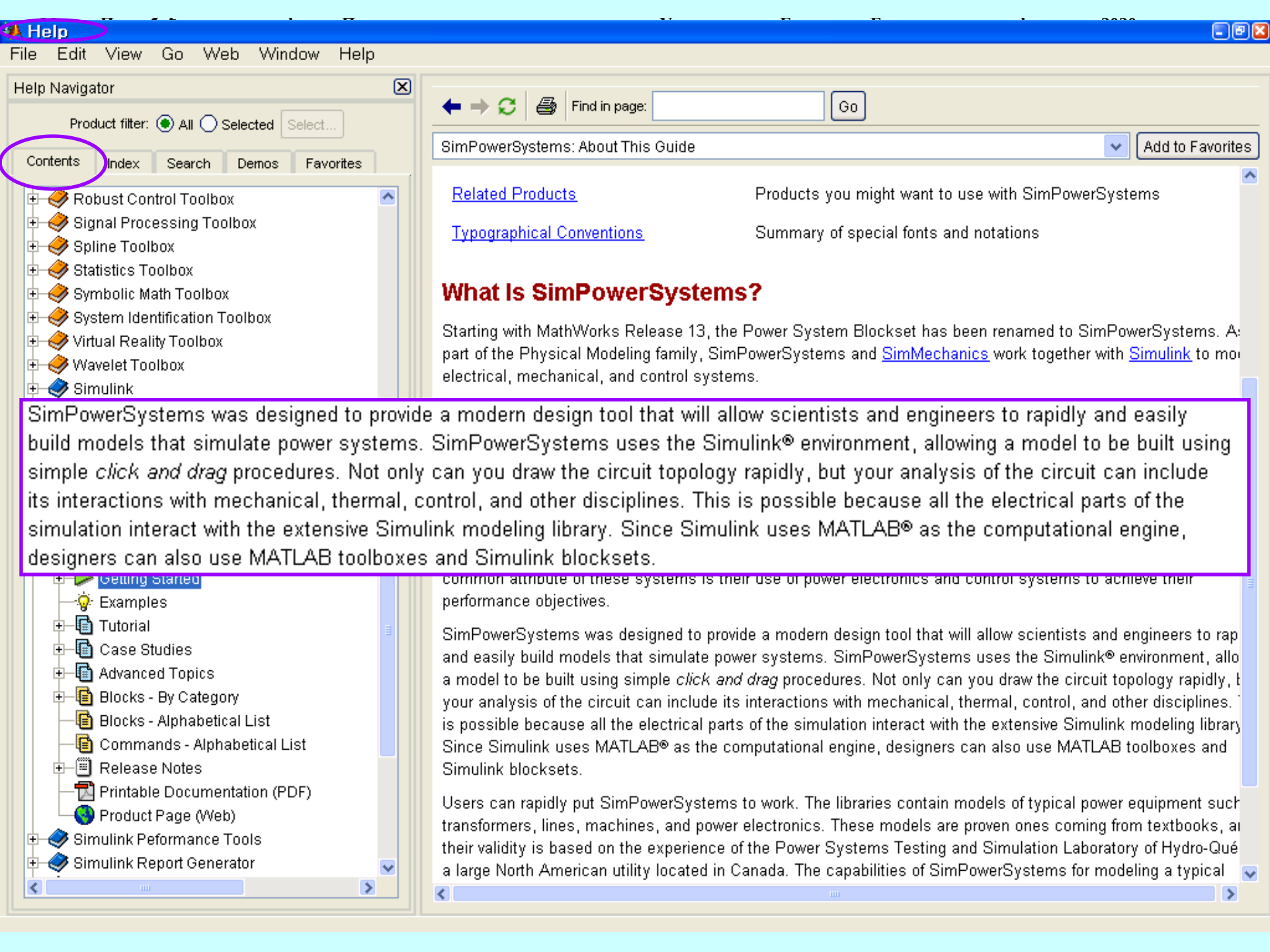


Symbolic Math Toolbox



SimPowerSystems





SimPowerSystems was designed to provide a modern design tool that will allow scientists and engineers to rapidly and easily build models that simulate power systems. SimPowerSystems uses the Simulink® environment, allowing a model to be built using simple *click and drag* procedures. Not only can you draw the circuit topology rapidly, but your analysis of the circuit can include its interactions with mechanical, thermal, control, and other disciplines. This is possible because all the electrical parts of the simulation interact with the extensive Simulink modeling library. Since Simulink uses MATLAB® as the computational engine, designers can also use MATLAB toolboxes and Simulink blocksets.

Help Navigator

Product filter: ☒ All ☐ Selected

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Find in page:

Example Index, SimPowerSystems

Examples

Use this example index to jump to code examples in the documentation.

Tutorials

- [Session 1: Simulating a Simple Circuit](#)
- [Session 2: Analyzing a Simple Circuit](#)
- [Session 3: Simulating Transients](#)
- [Session 4: Introducing Power Electronics](#)
- [Session 5: Simulating Motor Drives](#)
- [Session 6: Introducing the Phasor Simulation Method](#)
- [Session 7: Three-Phase Systems and Machines](#)
- [Modeling a Nonlinear Inductance](#)
- [Customizing Your Nonlinear Model](#)
- [Modeling a Nonlinear Resistance](#)

Case Studies

- [Series-Compensated Transmission Network](#)
- [Chopper-Fed DC Motor Drive](#)
- [Synchronous Machine and Regulators](#)
- [Variable-Frequency Induction Motor Drive](#)
- [HVDC System](#)

Advanced Methods

- [Changing Your Circuit Parameters](#)

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Example Index, SimPowerSystems

Add to Favorites

SimPowerSystems

Session 1: Simulating a Simple Circuit

The Power System Blockset allows you to build and simulate electrical circuits containing linear and nonlinear elements. During Sessions 1 through 3 you will build, analyze, and simulate the following circuit.

In this session you

- Explore the **powerlib** library of the Power System Blockset
- Learn how to build a simple circuit from the **powerlib** library
- Interconnect Simulink blocks with your circuit

The circuit below represents an equivalent power system feeding a 300 km transmission line. The line is compensated by a shunt inductor at its receiving end. A circuit breaker allows energizing and deenergizing of the line. In order to simplify matters, only one of the three phases is represented. The parameters shown in the figure are typical of a 735 kV power system.

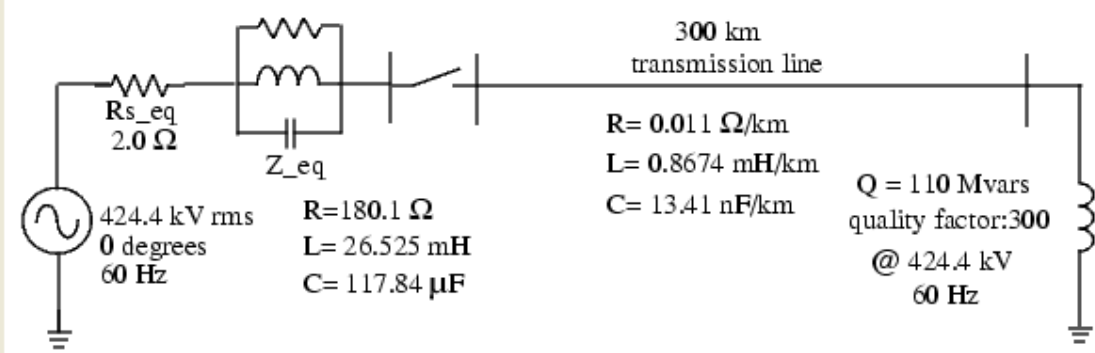


Figure 1-1: Circuit to Be Modeled with the Power System Blockset

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 - Features
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 - SimMechanics
 - SimPowerSystems**
 - AC Motor Drive - Vector Control
 - AC Surge Arrester
 - Asynchronous Machine
 - Cassie and Mayr Arc Model
 - Chopper-fed DC Motor Drive
 - Chopper-fed DC Motor Drive
 - Complete 12-pulse HVDC
 - Current Transformer Saturation
 - DC/DC and DC/AC PWM Converter
 - FFT analysis during simulation
 - GTO Buck Converter
 - Ideal Switch
 - Linear Filter

Find in page:

SimPowerSystems Demos

SimPowerSystems Demos

SimPowerSystems models and simulates electrical power systems and drives within the Simulink environment. Applications of this product include analysis and modeling of power utility distribution networks and self-contained power systems such as those for ships, aircraft, and spacecraft.

The product covers the following areas:

- Power system networks
- Electric machinery
- Power electronics
- Control and measurement
- Triphase machines

Simple Models

Linear Filter: Analysis of steady-state operation of a linear electrical circuit

Transient Analysis: Transient analysis of a linear circuit

Linear Transformer: Three-winding distribution transformer

Three-phase Saturable Transformer: Energization of a three-phase saturable transformer

Current Transformer Saturation: Measurement distortion due to saturation of a current transformer

AC Surge Arrester: Surge arresters used in a series and shunt compensated transmission

Single-phase Line: Time domain and frequency domain testing of a single phase line

Three-phase Line: Single phase energization of a three-phase line

Three-phase Dynamic Load and Programmable Source: Use of the 3-Phase Dynamic Load and 3-Phase Programmable Voltage Source blocks

Saturable Transformer with Hysteresis: Simulation of hysteresis in a Saturable Transformer block

Help Navigator

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 - GTO Buck Converter
 - Ideal Switch
 - Linear Filter

SimPowerSystems Demos

psbfilter

File Edit View Simulation Format Tools Help

Find in page: Go

Normal

SimPowerSystems Demos

Applications of the SimPowerSystems toolbox to power systems simulation.

The product covers:

- Power systems
- Electric machines
- Power electronics
- Control systems
- Triphase systems

Simple Models

Linear Filter: Analysis

Transient Analysis

Linear Transform

Three-phase Saturation

Current Transformer Saturation

AC Surge Arrester

Single-phase Line

Three-phase Line

Three-phase Dynamic Load and Programmable Source

Saturable Transformer with Hysteresis

Simulation of hysteresis in a Saturable Transformer block

Powergui -Continuous

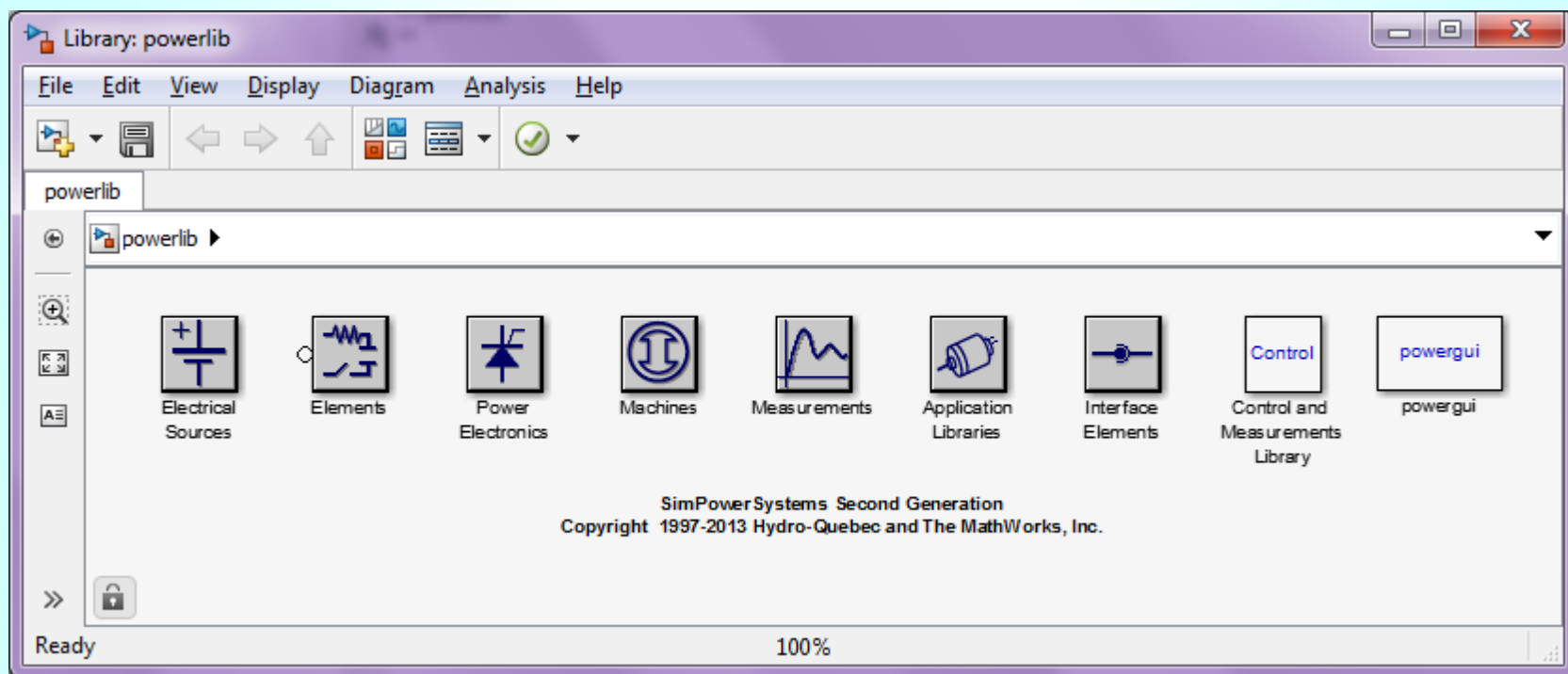
Analysis of steady-state operation of a linear electrical circuit

Double click on the More Info button (?) for details

Ready 100% ode45

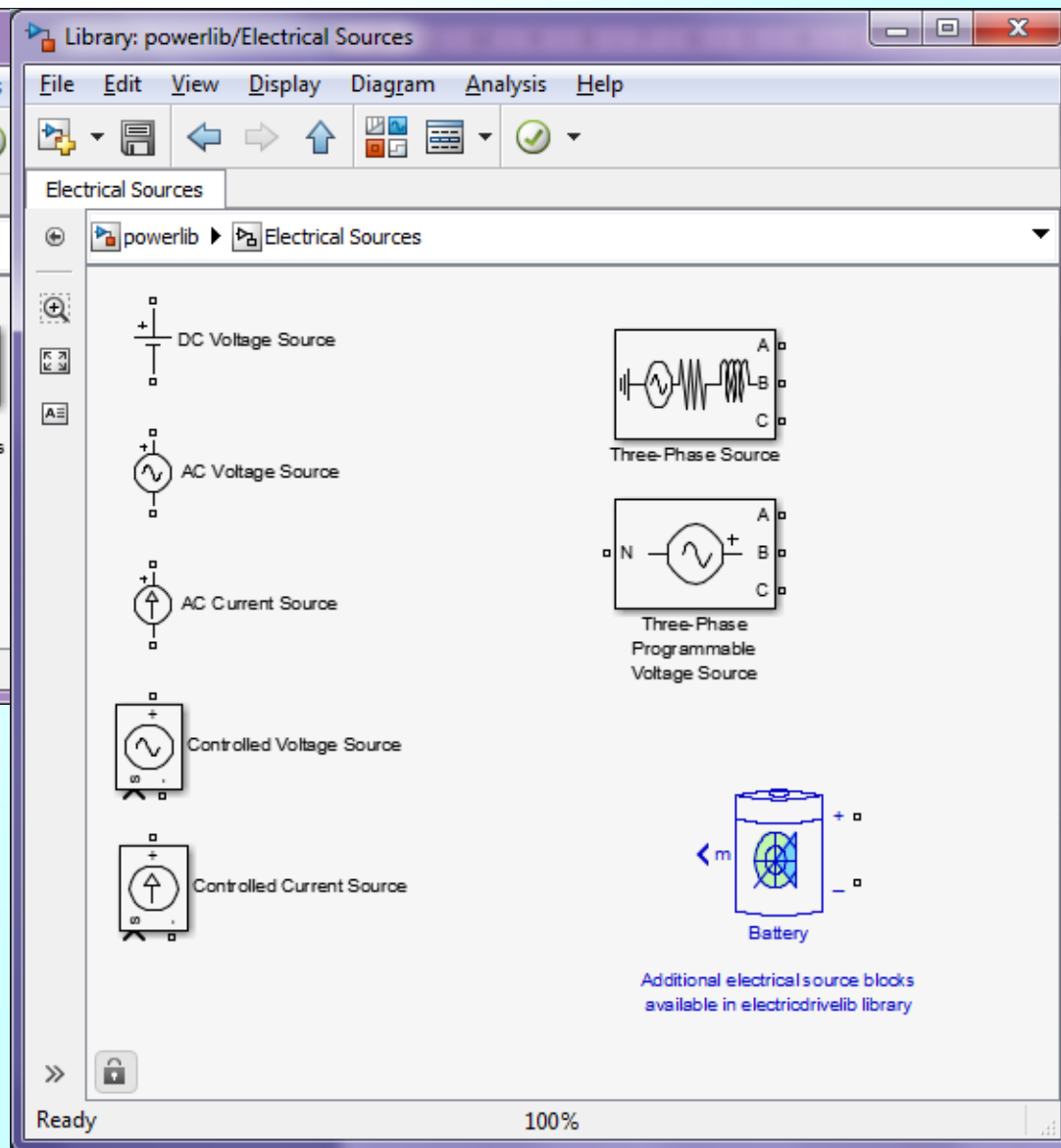
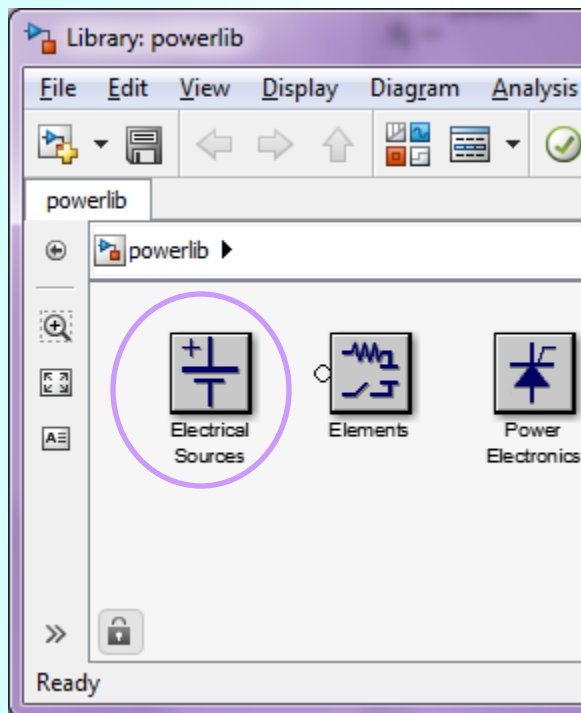
Симулација електричних кола

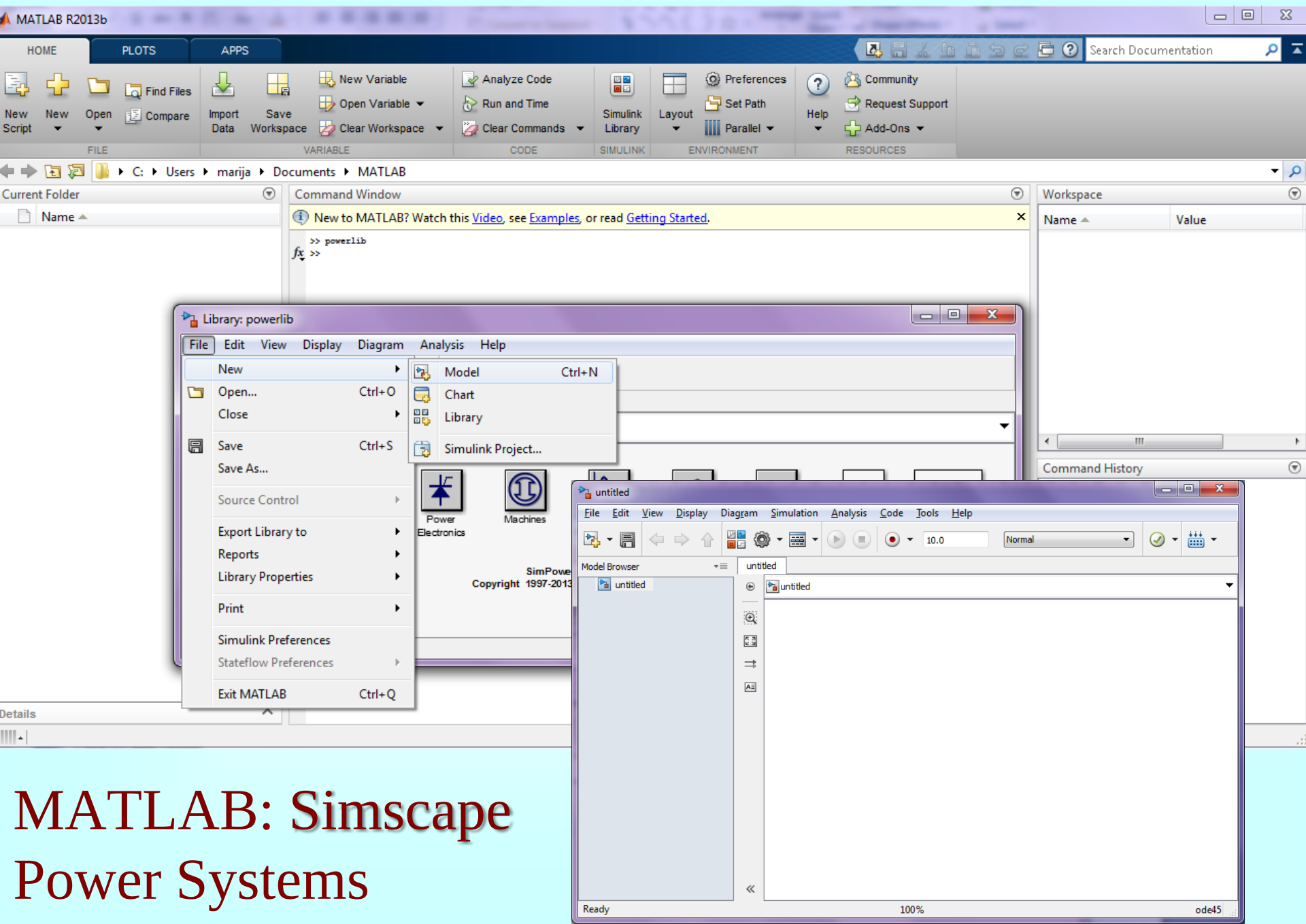
powerlib



Симулација електричних кола

powerlib

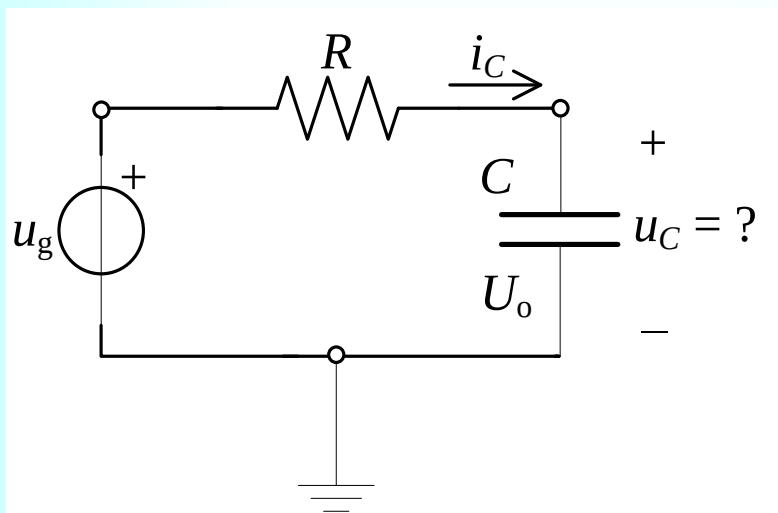




MATLAB: Simscape Power Systems

Пример анализе ел. кола

коло је образовано у тренутку $t_0 = 0$

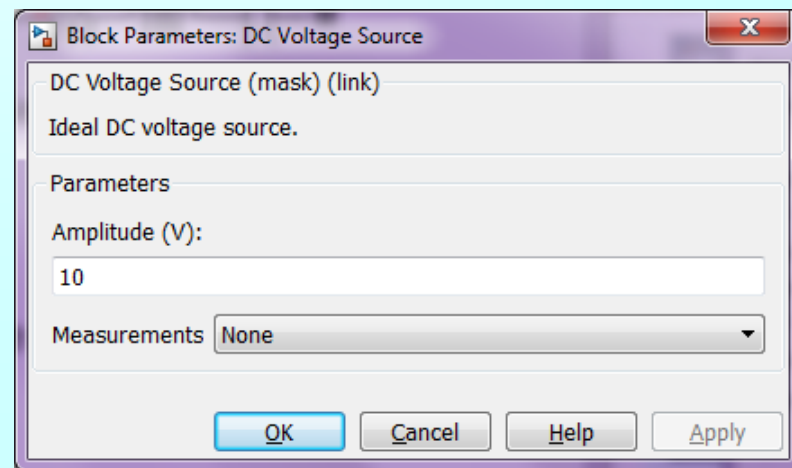
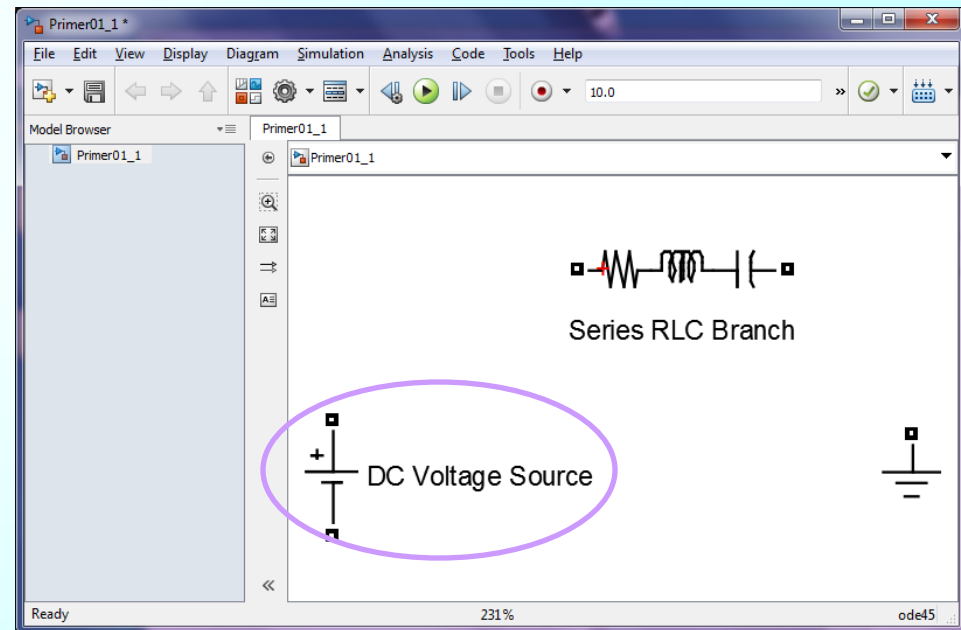


$$R = 1\text{ k}\Omega$$

$$C = 1\text{ }\mu\text{F}$$

$$u_g(t) = U h(t), U = 10\text{ V}$$

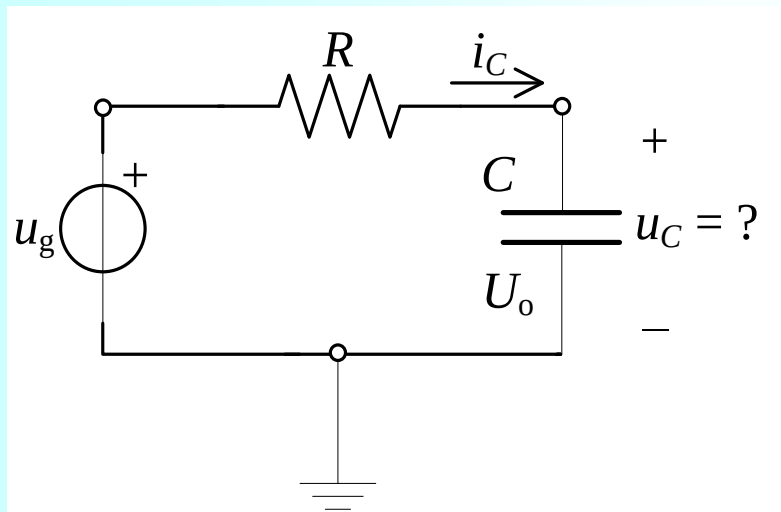
$$u(t_0^-) = U_0 = -10\text{ V}$$



MATLAB: Simscape
Power Systems

Подешавање параметара ел. кола

коло је образовано у тренутку $t_0 = 0$

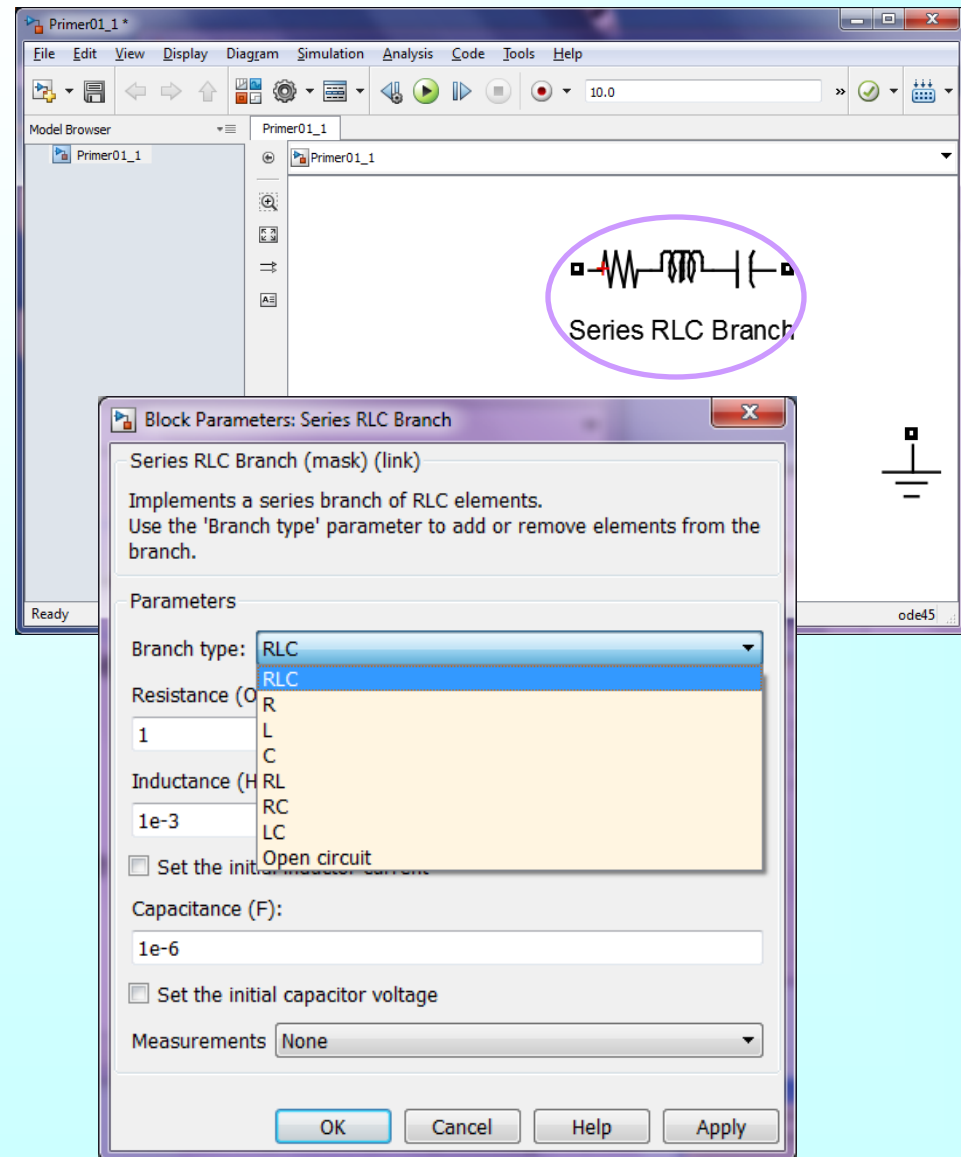


$$R = 1\text{k}\Omega$$

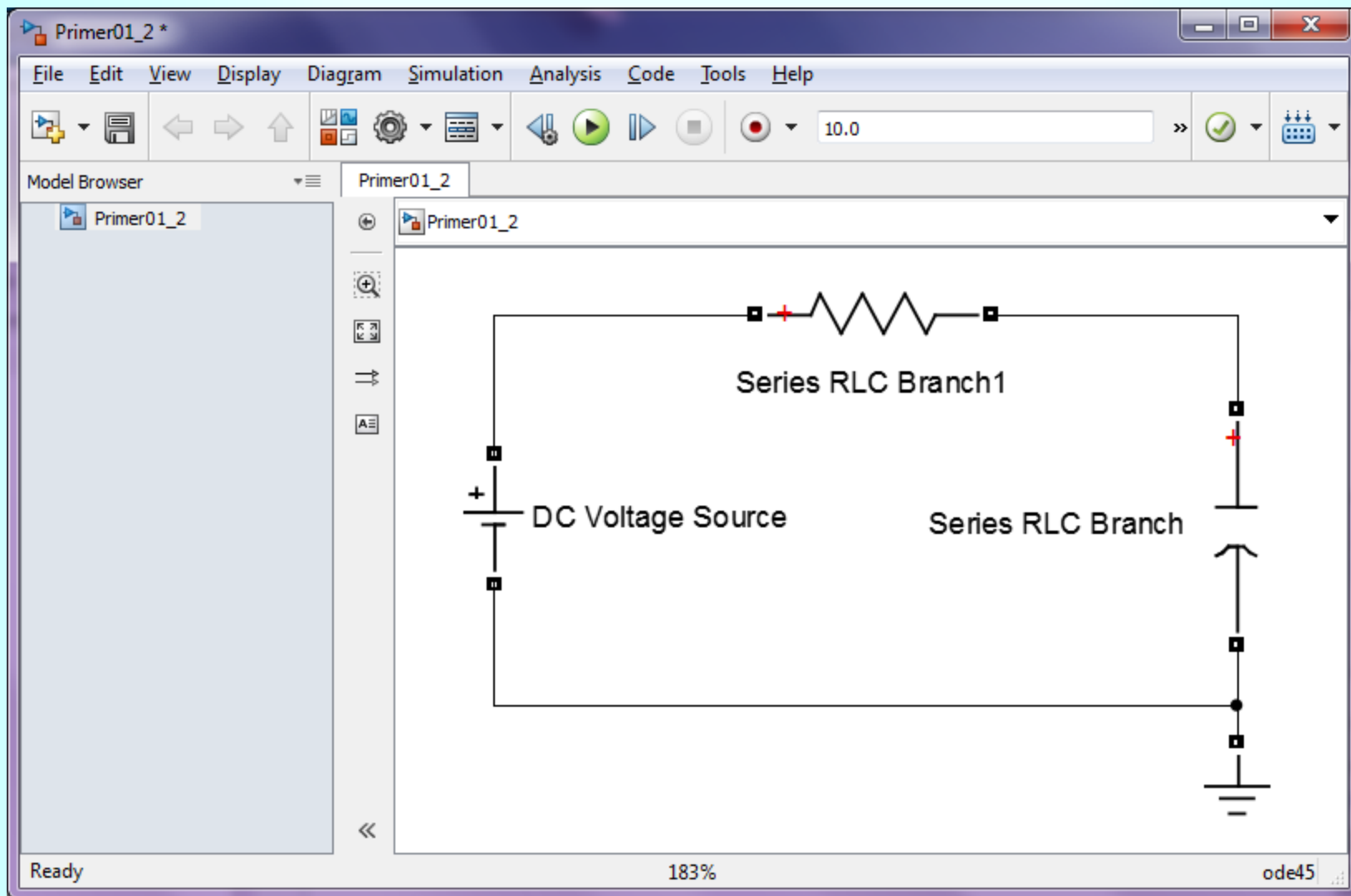
$$C = 1\mu\text{F}$$

$$u_g(t) = U h(t), U = 10\text{ V}$$

$$u(t_0^-) = U_0 = -10\text{ V}$$



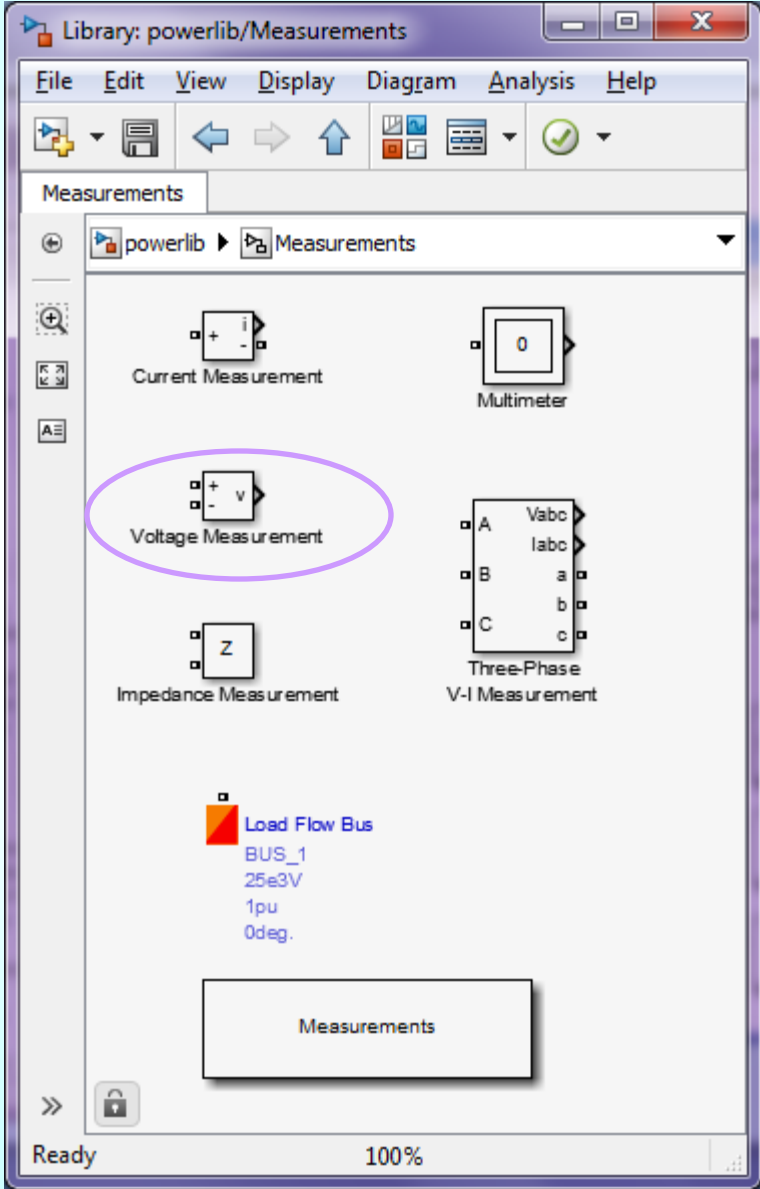
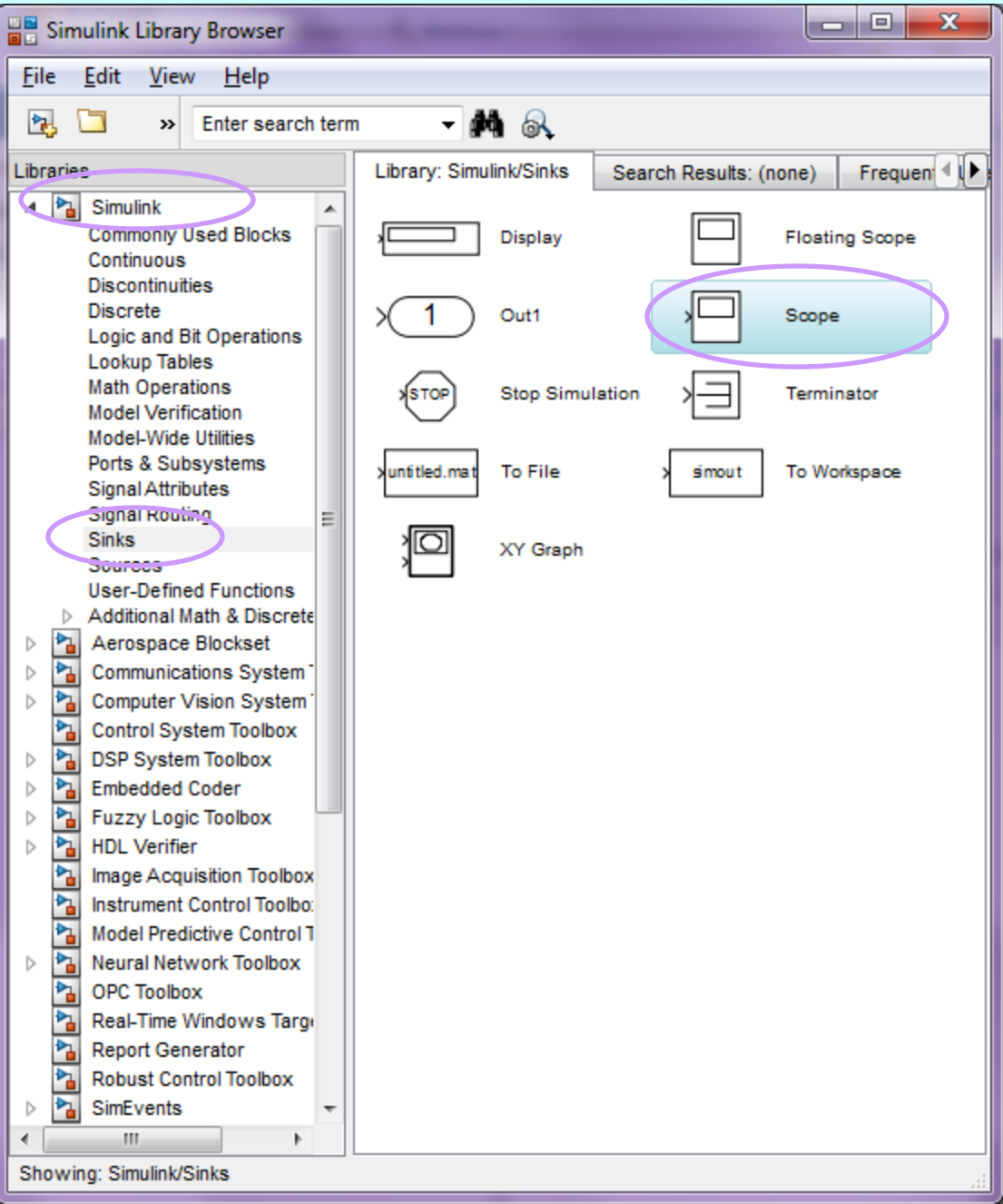
MATLAB: Simscape
Power Systems



MATLAB: Simscape
Power Systems

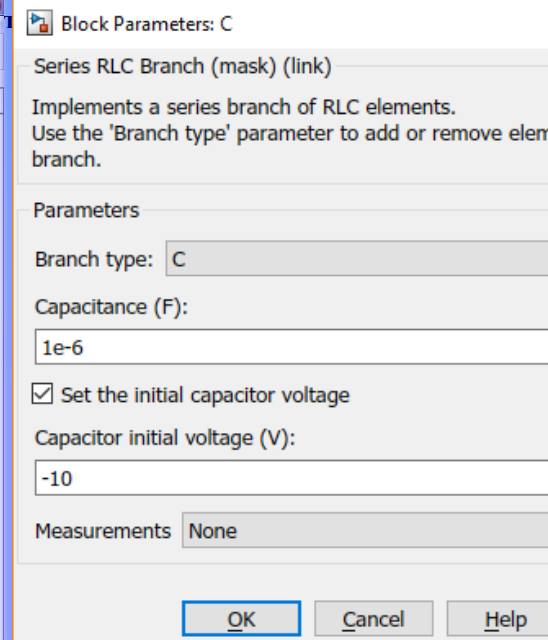
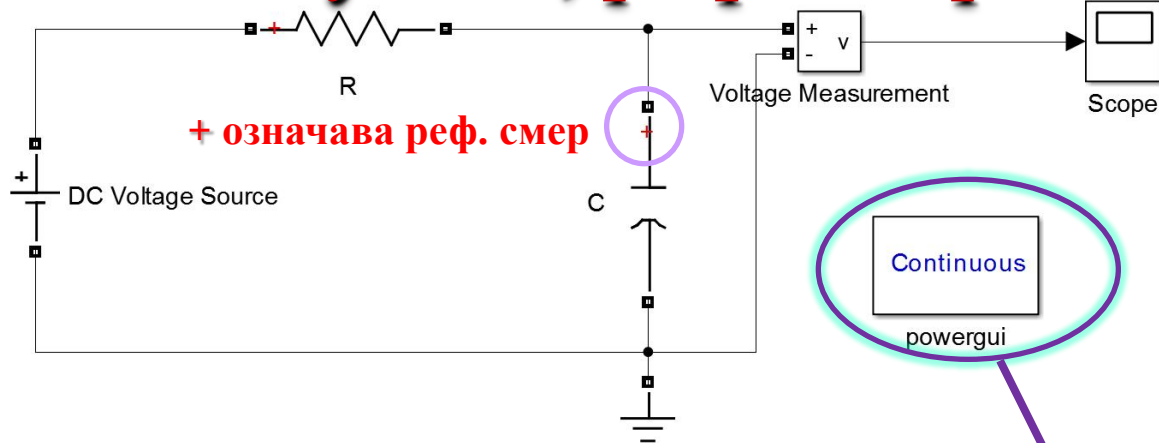
Како се мери напон???

MATLAB: Simscape Power Systems

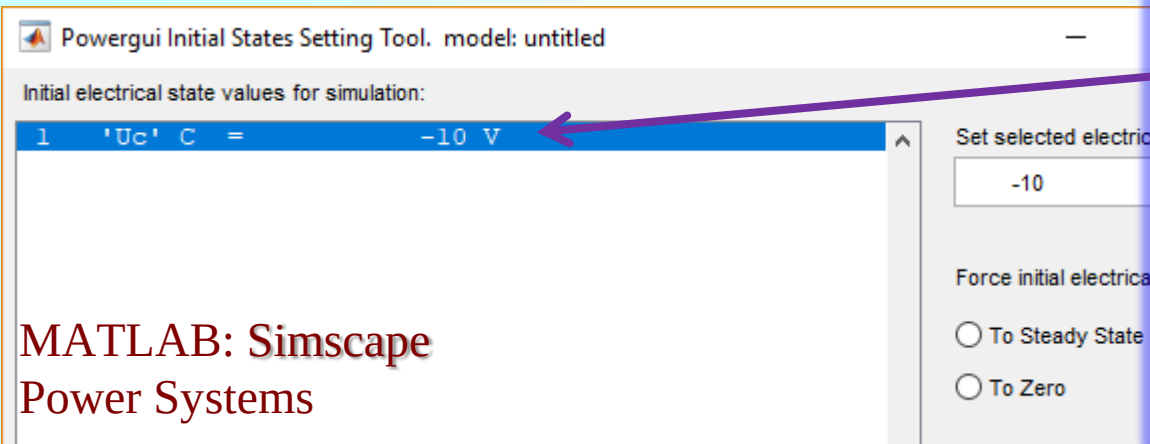
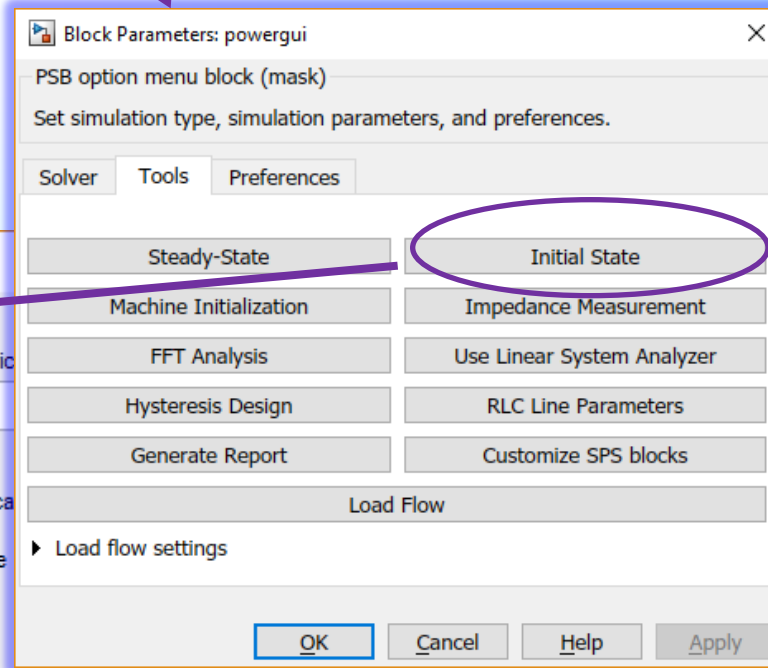


Почетни услов, реф. смер...

+ означава реф. смер



Плоче кондензатора се разликују!!!



MATLAB: Simscape
Power Systems

Configuration Parameters: untitled/Configuration (Active)

★ Commonly Used Parameters

All Parameters

Select:

Solver

Data Import/Export

> Optimization

> Diagnostics

Hardware Implementation

Model Referencing

Simulation Target

> Code Generation

> Coverage

> HDL Code Generation

Simscape

Simscape Multibody 1G

> Simscape Multibody

Simulation time

Start time: 0.0Stop time: 0.01

Solver options

Type: Variable-stepSolver: auto (Automatic solver selection)

> Additional options

?

OKCancelHelpApply

Configuration Parameters: untitled/Configuration (Active)

★ Commonly Used Parameters

≡ All Parameters

Category: All

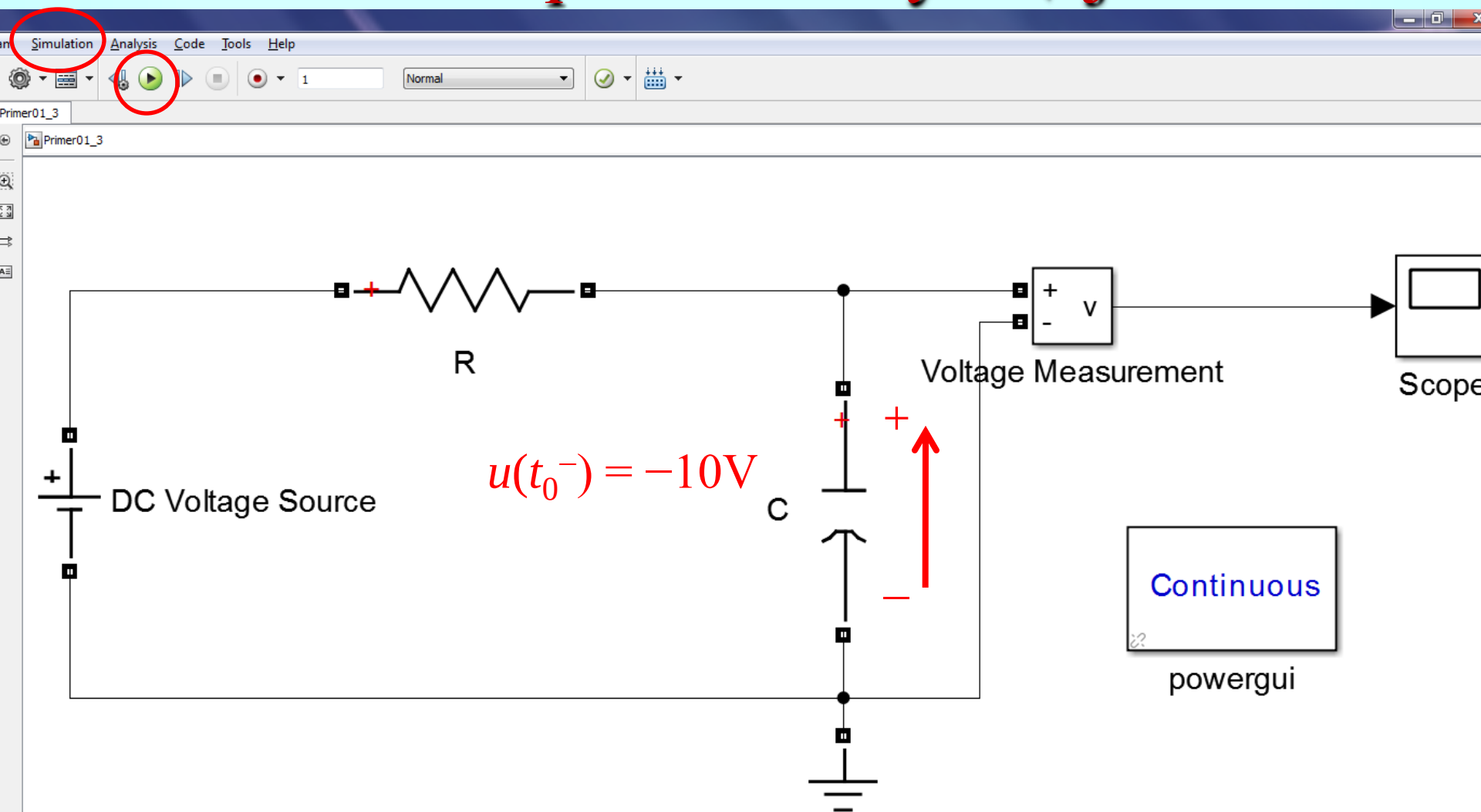
Search selected category

Parameter	Value	Command-Line Name
Solver ▶ Simulation time		
> Start time Simulation start time. Note that the values that you specify as block i...	0.0	StartTime
> Stop time Simulation stop time.	0.01	StopTime
Solver ▶ Solver options		
> Type Choose a variable or fixed-step solver.	Variable-step	SolverType
> Solver Choose a solver. If disabled, enable in "Additional options" by changi...	auto (Automatic solver selection)	Solver
Solver ▶ Additional options		
> Max step size Maximum step size for a variable-step solver.	1e-4	MaxStep
> Relative tolerance Specify the largest acceptable solver error, relative to the size of eac...	1e-3	RelTol
> Min step size Minimum step size for a variable-step solver.	auto	MinStep
> Absolute tolerance Specify the largest acceptable solver error, as the value of the meas...	auto	AbsTol
> Initial step size Specify the size of the first time step that the solver takes.	auto	InitialStep
> Shape preservation Improve the integration accuracy by preserving the shape of states b...	Disable All	ShapePreserveControl

?

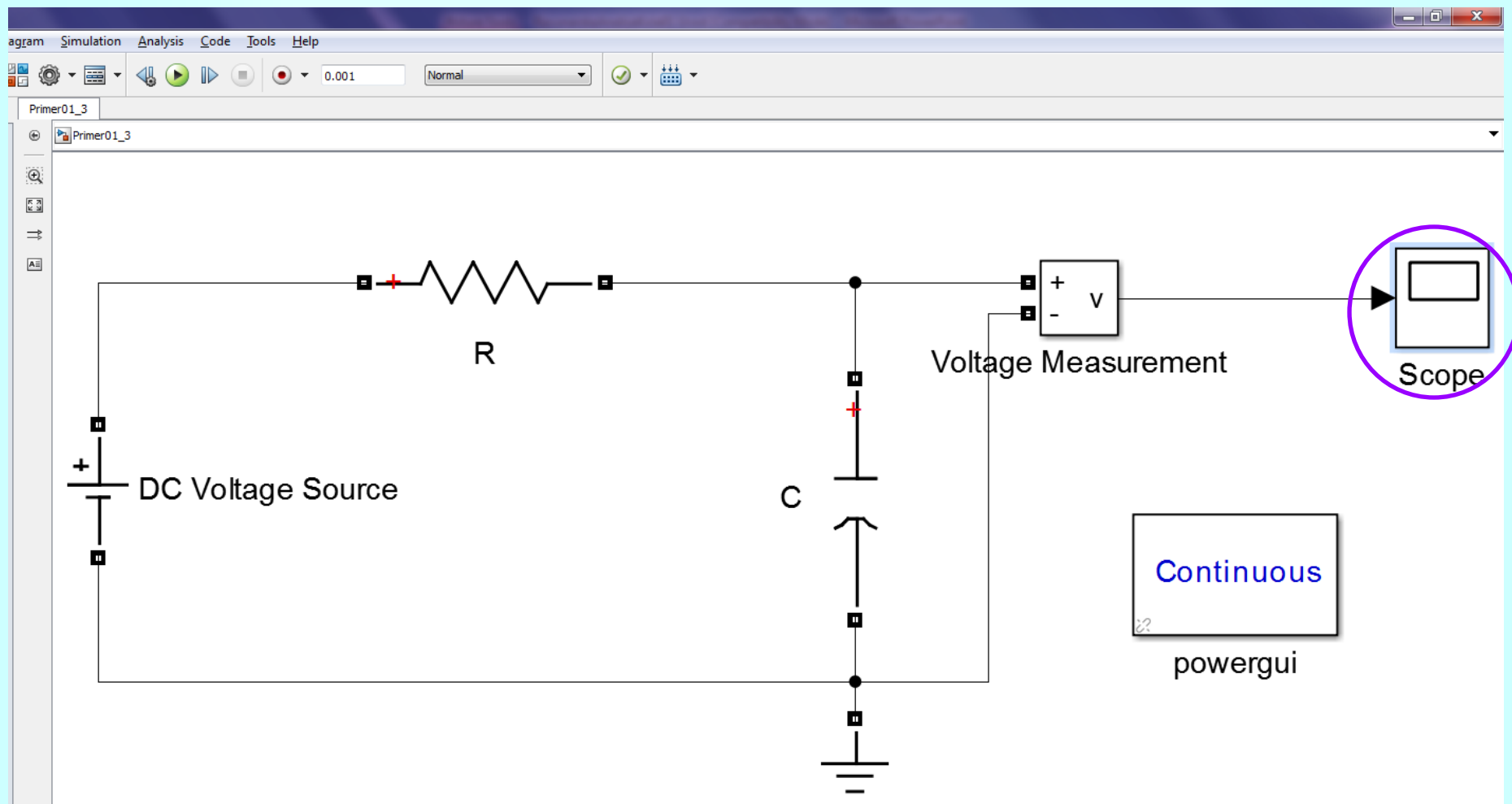
OKCancelHelpApply

Покретање симулације...

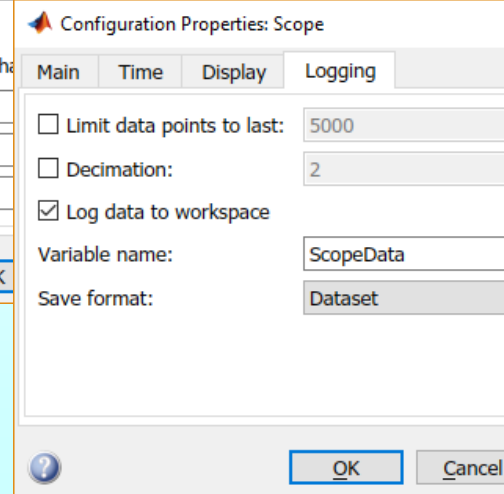
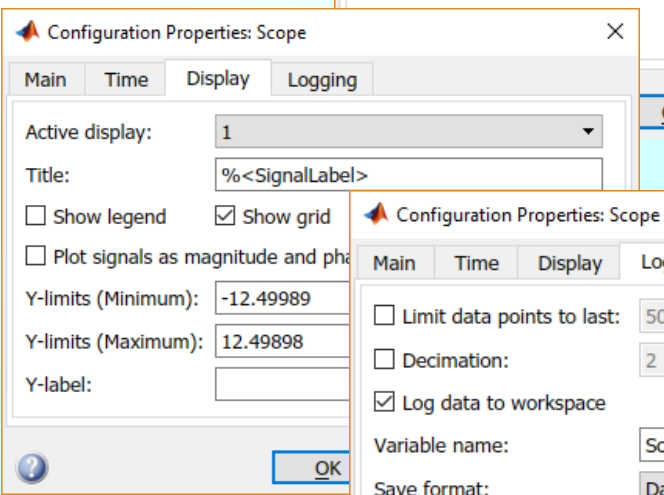
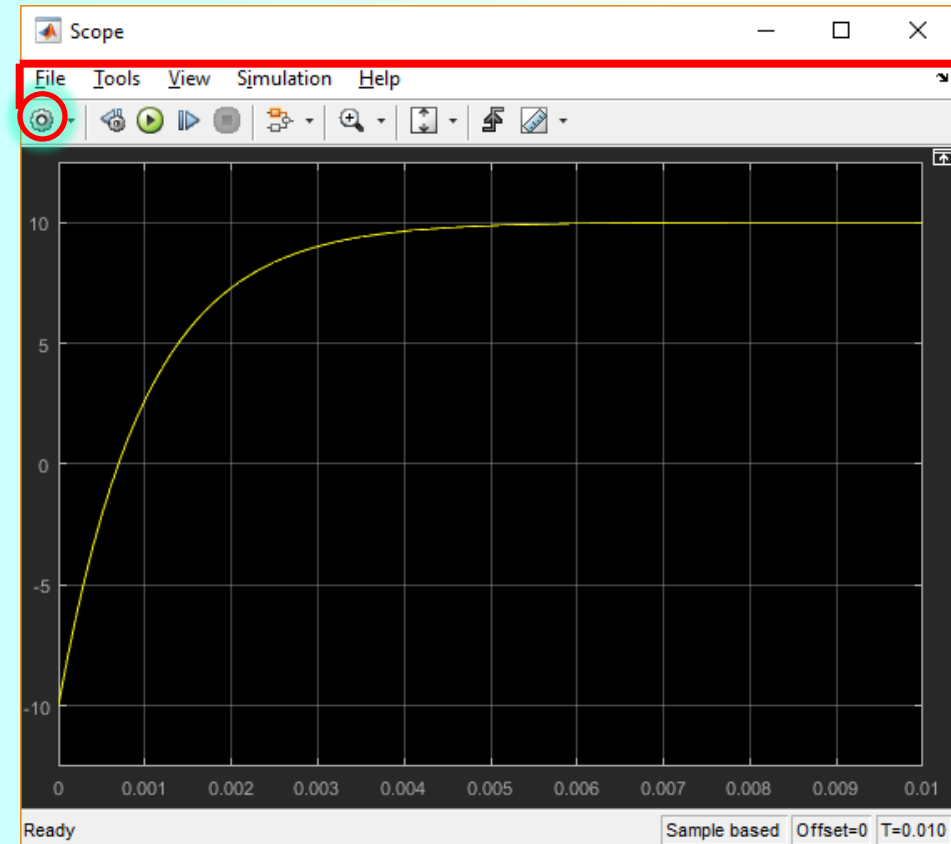
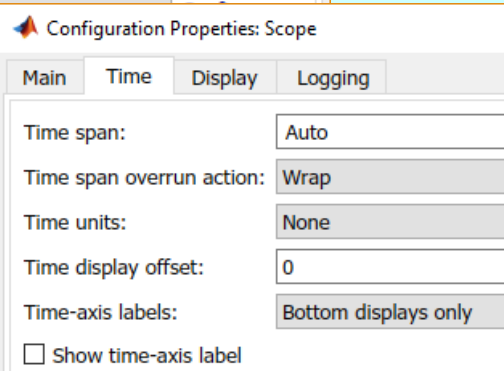
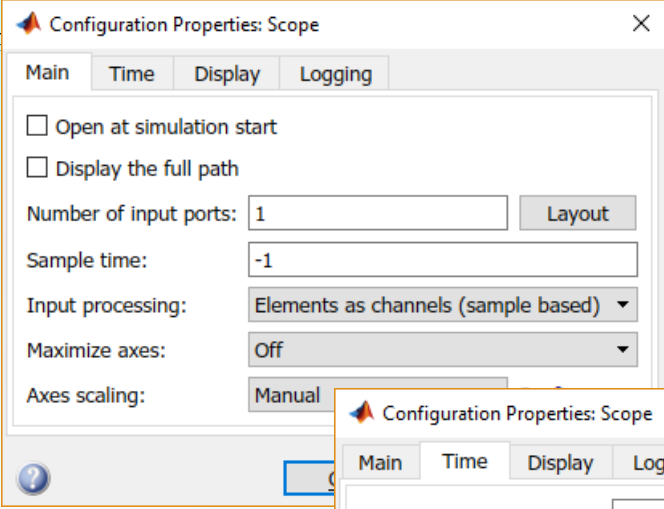
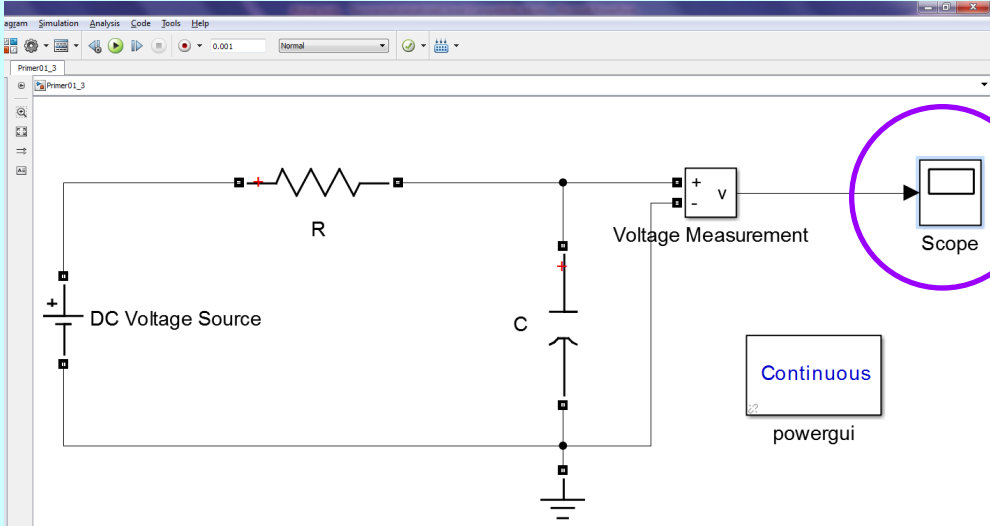


MATLAB: Simscape
« Power Systems

Налажење одзива... Осцилоскоп



MATLAB: Simscape
Power Systems



MATLAB: Simscape
Power Systems

Configuration Parameters: untitled/Configuration (Active)

★ Commonly Used Parameters ≡ All Parameters

Category: All

Parameter	Value	Command-Line Name
Solver ▶ Simulation time		
> Start time Simulation start time. Note that the values that you specify as block i...	0.0	StartTime
> Stop time Simulation stop time.	0.01	StopTime
Solver ▶ Solver options		
> Type Choose a variable or fixed-step solver.	Variable-step	SolverType
> Solver Choose a solver. If disabled, enable in "Additional options" by changi...	auto (Automatic solver selection)	Solver
Solver ▶ Additional options		
> Max step size Maximum step size for a variable-step solver.	1e-4	MaxStep
> Relative tolerance Specify the largest acceptable solver error, relative to the size of eac...	1e-3	RelTol
> Min step size Minimum step size for a variable-step solver.	auto	MinStep
> Absolute tolerance Specify the largest acceptable solver error, as the value of the meas...	auto	AbsTol
> Initial step size Specify the size of the first time step that the solver takes.	auto	InitialStep
> Shape preservation Improve the integration accuracy by preserving the shape of states b...	Disable All	ShapePreserveControl

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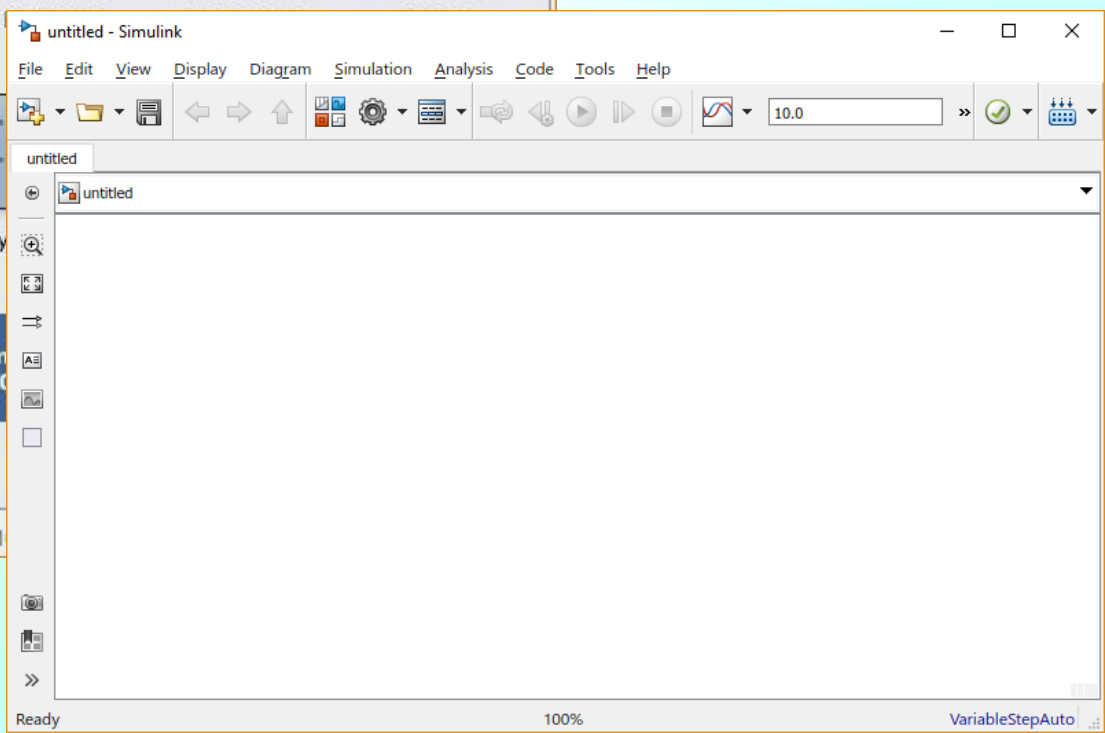
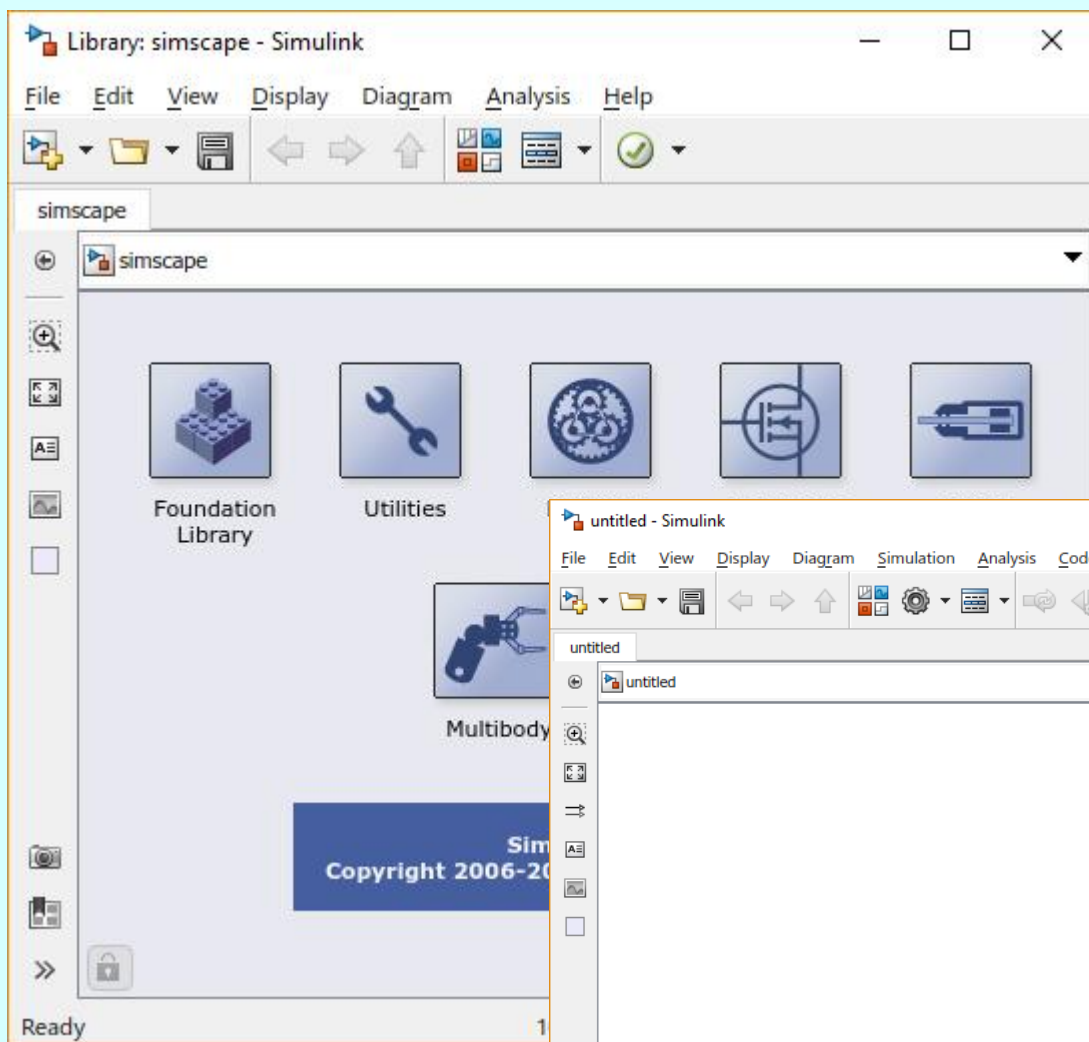
OK Cancel Help Apply

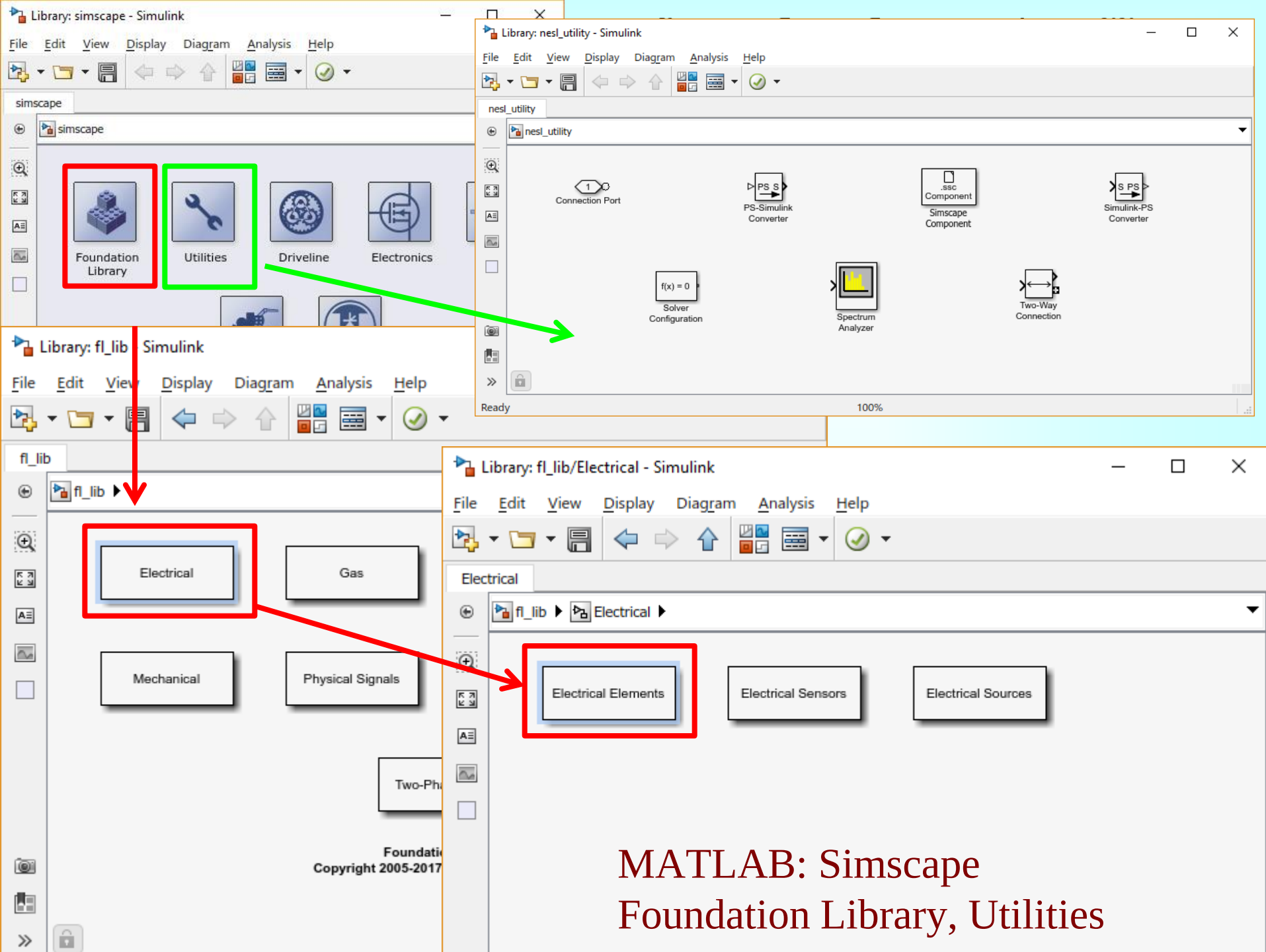
$\tau = RC = 1\text{ms}$

$\tau/10 = 0.1\text{ms}$

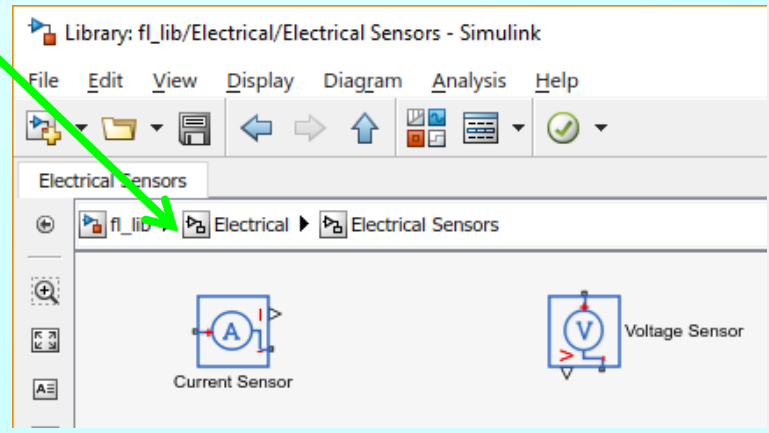
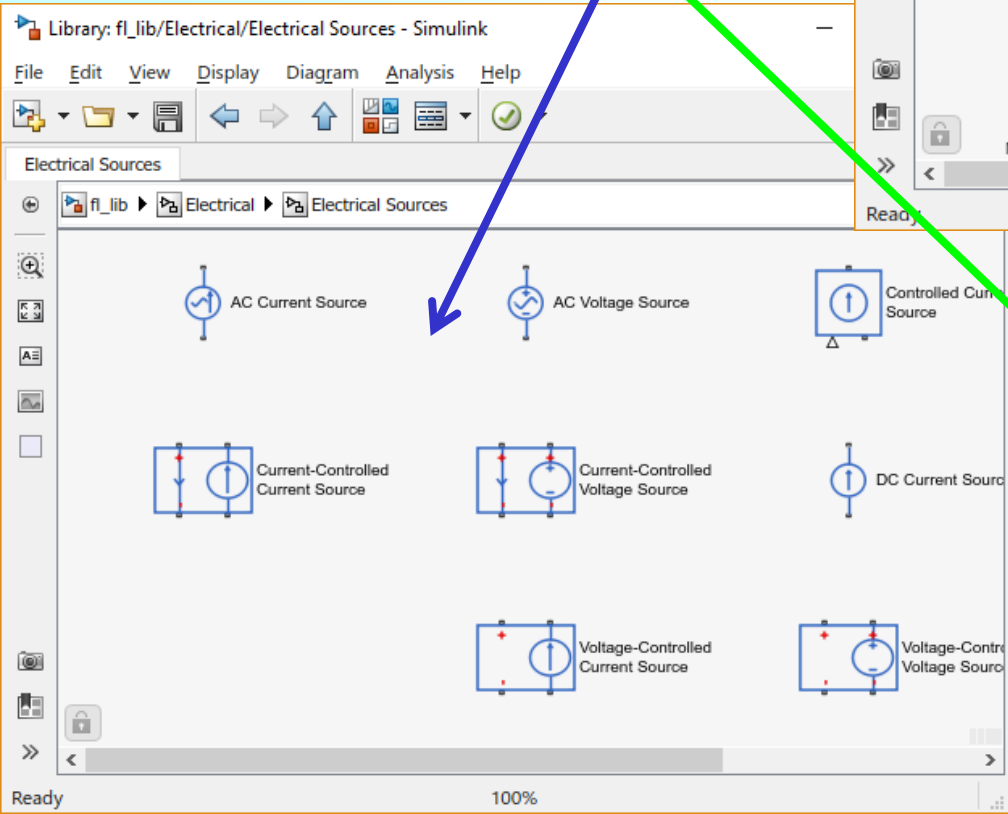
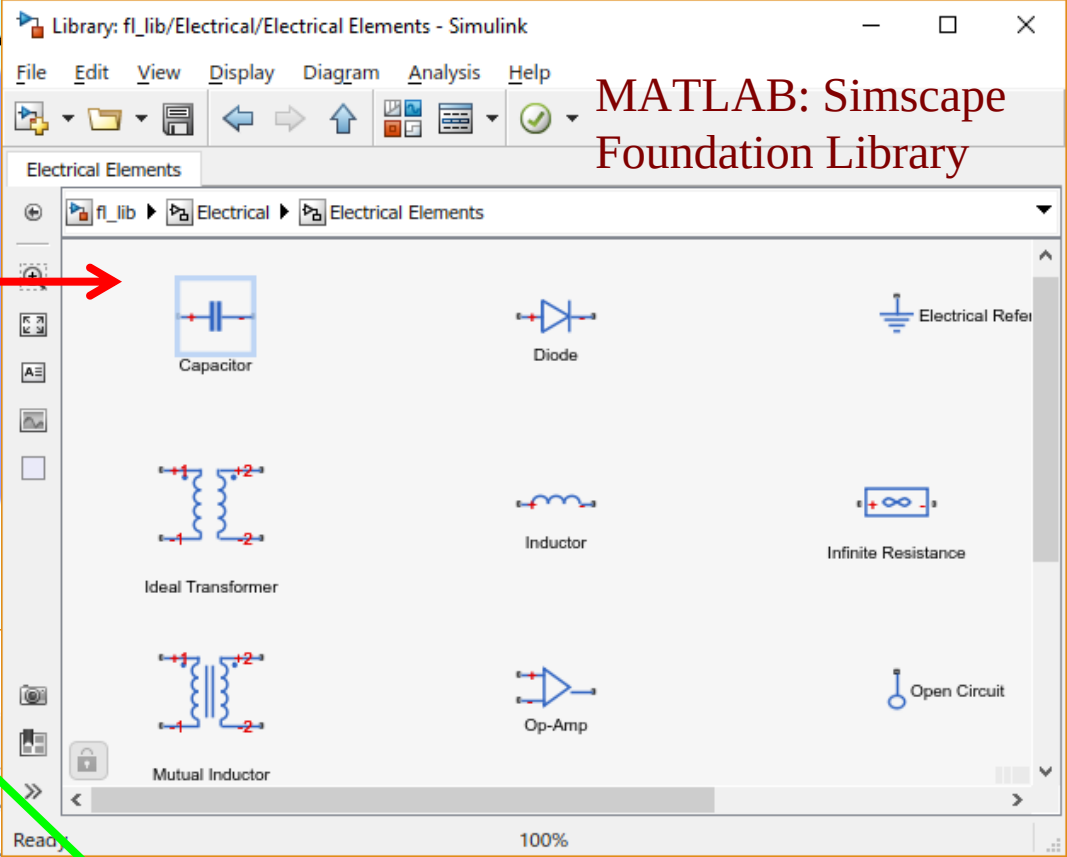
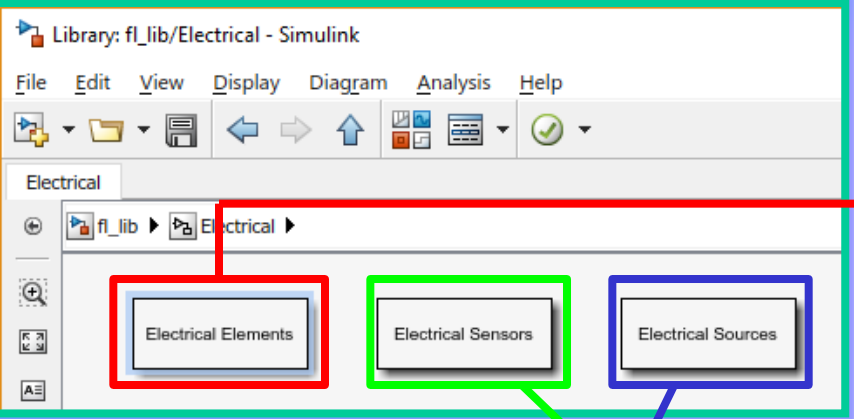
Simscape – Foundation Library, Utilities

simscape

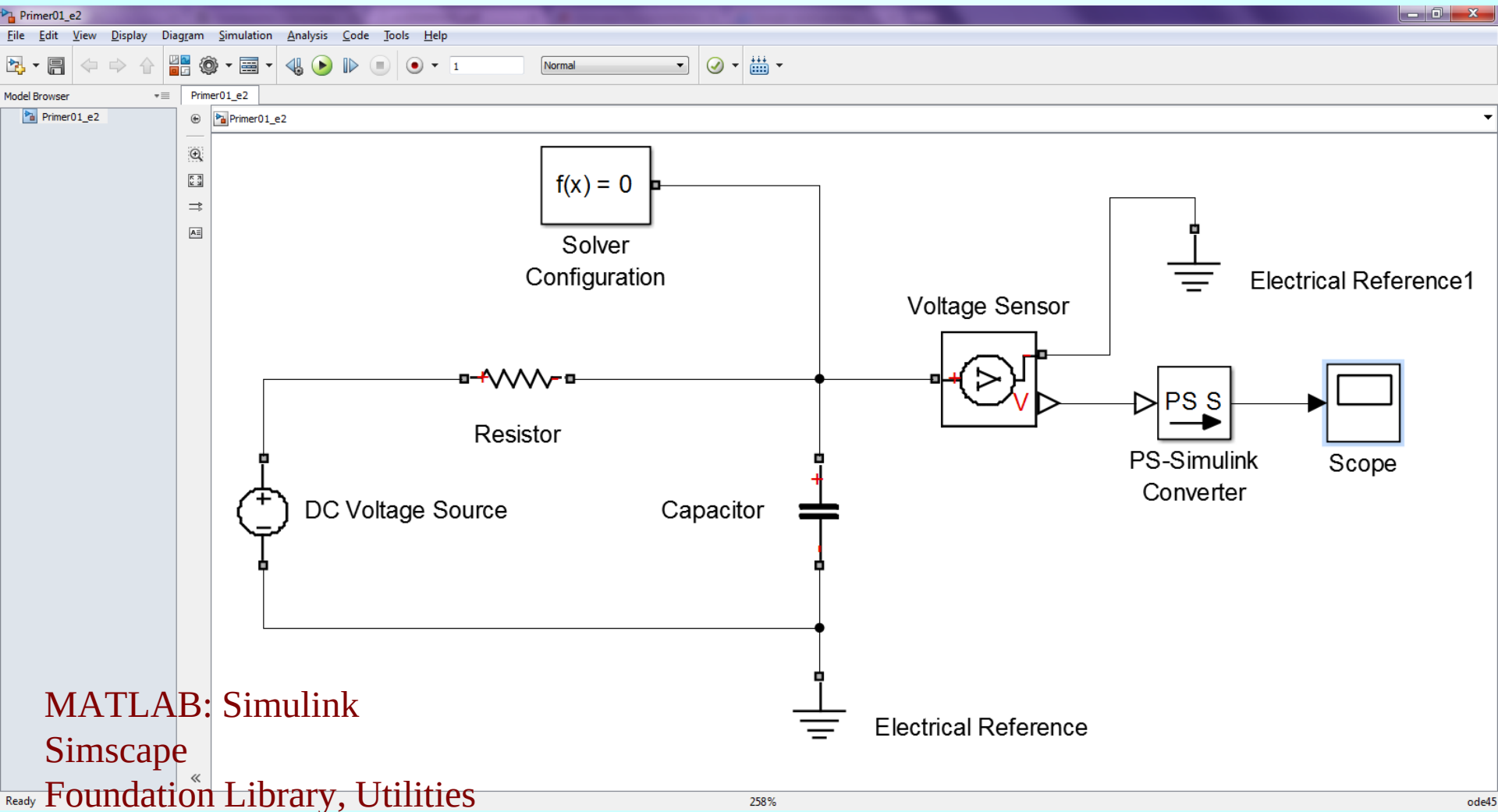




MATLAB: Simscape Foundation Library



Анализа електричног кола



MATLAB: Simulink

Simscape

Foundation Library, Utilities

Block Parameters: Solver Configuration

Solver Configuration
Defines solver settings to use for simulation.

Parameters

☐ Start simulation from steady state

Consistency tolerance

☐ Use local solver

Solver type

Sample time

☐ Use fixed-cost runtime consistency iterations

Nonlinear iterations

Mode iterations

Linear Algebra

Delay memory budget [kB]

☒ Apply filtering at 1-D/3-D connections when needed

Filtering time constant

Block Parameters: DC Voltage Source

DC Voltage Source

The ideal voltage source maintains a constant voltage across its output terminals, independent of the current flowing through the source. The output voltage is defined by the Constant voltage parameter, and can be any real value.

[Source code](#)

Settings

Parameters

Constant voltage:

Block Parameters: Resistor

Resistor

The voltage-current (V-I) relationship for a linear resistor is $V=I \cdot R$, where R is the constant resistance in ohms.

The positive and negative terminals of the resistor are denoted by the + and - signs respectively. By convention, the voltage across the resistor is given by $V(+)-V(-)$, and the sign of the current is positive when flowing through the device from the positive to the negative terminal. This convention ensures that the power absorbed by a resistor is always positive.

[Source code](#)

Settings

Parameters Variables

Resistance:

MATLAB: Simulink
Simscape
Foundation Library, Utilities

Block Parameters: Capacitor

Capacitor

Models a linear capacitor. The relationship between voltage V and and current I is $I=C*dV/dt$ where C is the capacitance in farads.

The Series resistance and Parallel conductance represent small parasitic effects. The parallel conductance can be used to model dielectric losses and the series resistance used to represent the effective series resistance (ESR) of the capacitor. Simulation of some circuits may require the presence of the small series resistance. Consult the documentation for further details.

[Source code](#)

Settings

Parameters

Variables

Capacitance:

1e-6

F

Series resistance:

0

Ohm

Parallel conductance:

0

1/Ohm

OK

Cancel

Help

Apply

Почетни услов...

MATLAB: Simulink
Simscape
Foundation Library, Utilities

Settings

Parameters

Variables

Override	Variable	Priority	Beginning Value	Unit
☐	Current	None	0	A
☐	Voltage	None	0	V
☒	Capacitor voltage	High	-10	V

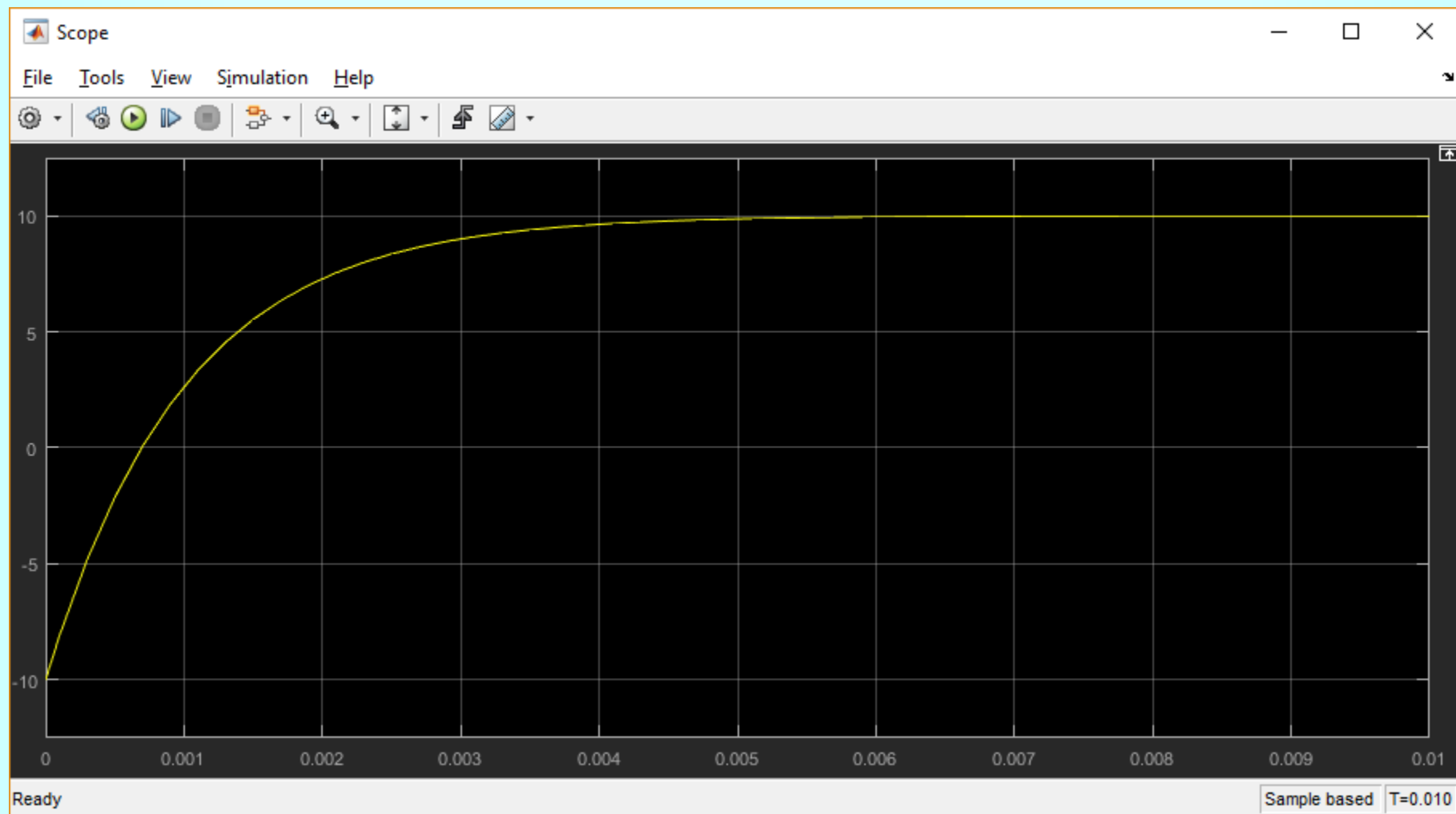
OK

Cancel

Help

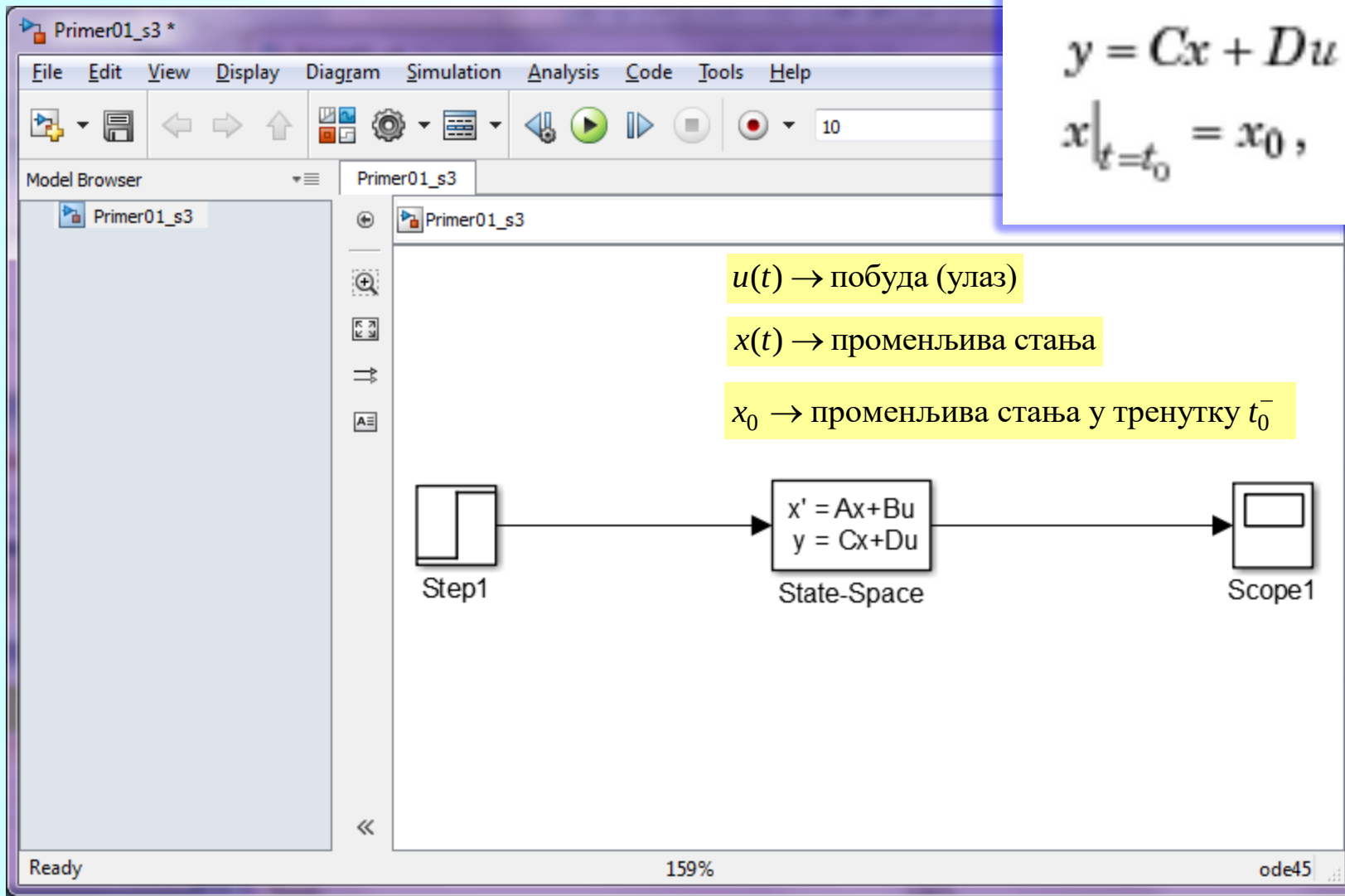
Apply

Налажење одзива...

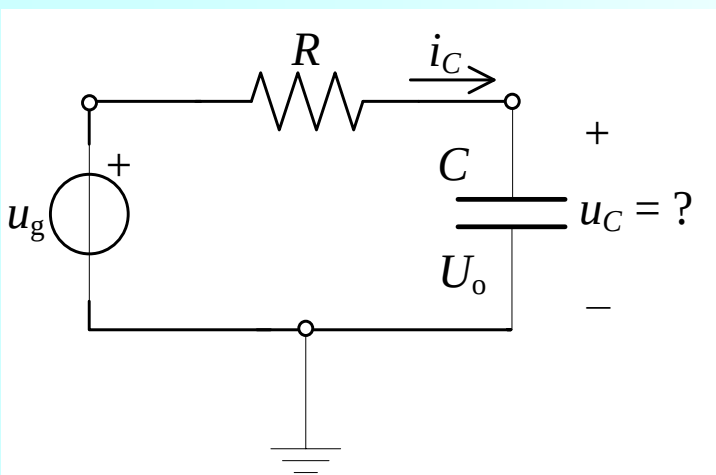


Simulink

$$\begin{aligned}\dot{x} &= Ax + Bu \\ y &= Cx + Du \\ x|_{t=t_0} &= x_0,\end{aligned}$$



коло је образовано у тренутку $t_0 = 0$



$$R = 1\text{k}\Omega$$

$$C = 1\mu\text{F}$$

$$u_g(t) = U h(t), U = 10\text{ V}$$

$$u_C(t_0^-) = U_0 = -10\text{ V}$$

Simulink

$$\begin{aligned}\dot{x} &= Ax + Bu \\ y &= Cx + Du \\ x|_{t=t_0} &= x_0,\end{aligned}$$

$$u = u_g(t) \rightarrow \text{побуда (улаз)}$$

$$x = u_C(t) \rightarrow \text{напон кондензатора (променљива стања и одзив - излаз)}$$

$$x(t_0^-) = U_0 \rightarrow \text{напон кондензатора у тренутку } t_0^-$$

$$u_g(t) = Ri_C + u_C(t)$$

$$i_C = C \frac{du_C}{dt}$$

$$u_C(t_0^-) = U_0 = -10\text{ V}$$

$$\frac{du_C(t)}{dt} = \frac{i_C}{C} = \frac{u_g(t) - u_C(t)}{RC} = -\frac{u_C(t)}{RC} + \frac{u_g(t)}{RC}$$

$$u_C(t_0^-) = U_0 = -10\text{ V}$$

$$\frac{du_C(t)}{dt} = Au_C(t) + Bu_g(t) \Rightarrow A = -\frac{1}{RC} = -1000, B = 1000$$

$$u_C(t) = Cu_C(t) \Rightarrow C = 1, D = 0$$

$$u_C(t_0^-) = U_0 = -10\text{ V}$$

Source Block Parameters: Step1

Step

Output a step.

Parameters

Step time:

0

Initial value:

0

Final value:

10

Sample time:

0

☒ Interpret vector parameters as 1-D

☒ Enable zero-crossing detection

OK Cancel Help Apply

Simulink

Function Block Parameters: State-Space

State Space

State-space model:

$$\frac{dx}{dt} = Ax + Bu$$
$$y = Cx + Du$$

Parameters

A:

-1000

B:

1000

C:

1

D:

0

Initial conditions:

-10

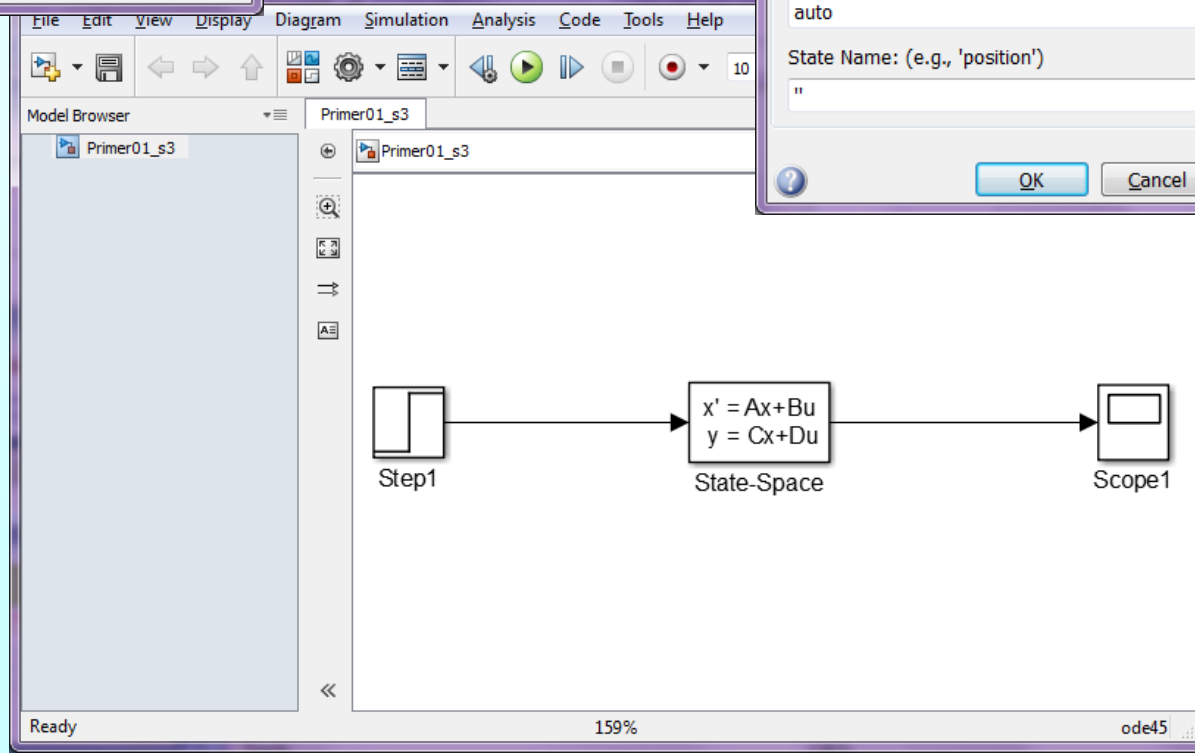
Absolute tolerance:

auto

State Name: (e.g., 'position')

"

? OK Cancel Help Apply



Simulink

Function Block Parameters: State-Space

State Space

State-space model:
 $\dot{x}/dt = Ax + Bu$
 $y = Cx + Du$

Parameters

A:

B:

C:

D:

Initial conditions:

Absolute tolerance:

State Name: (e.g., 'position')

OK

Source Block Parameters: Step1

Step

Output a step.

Parameters

Step time:

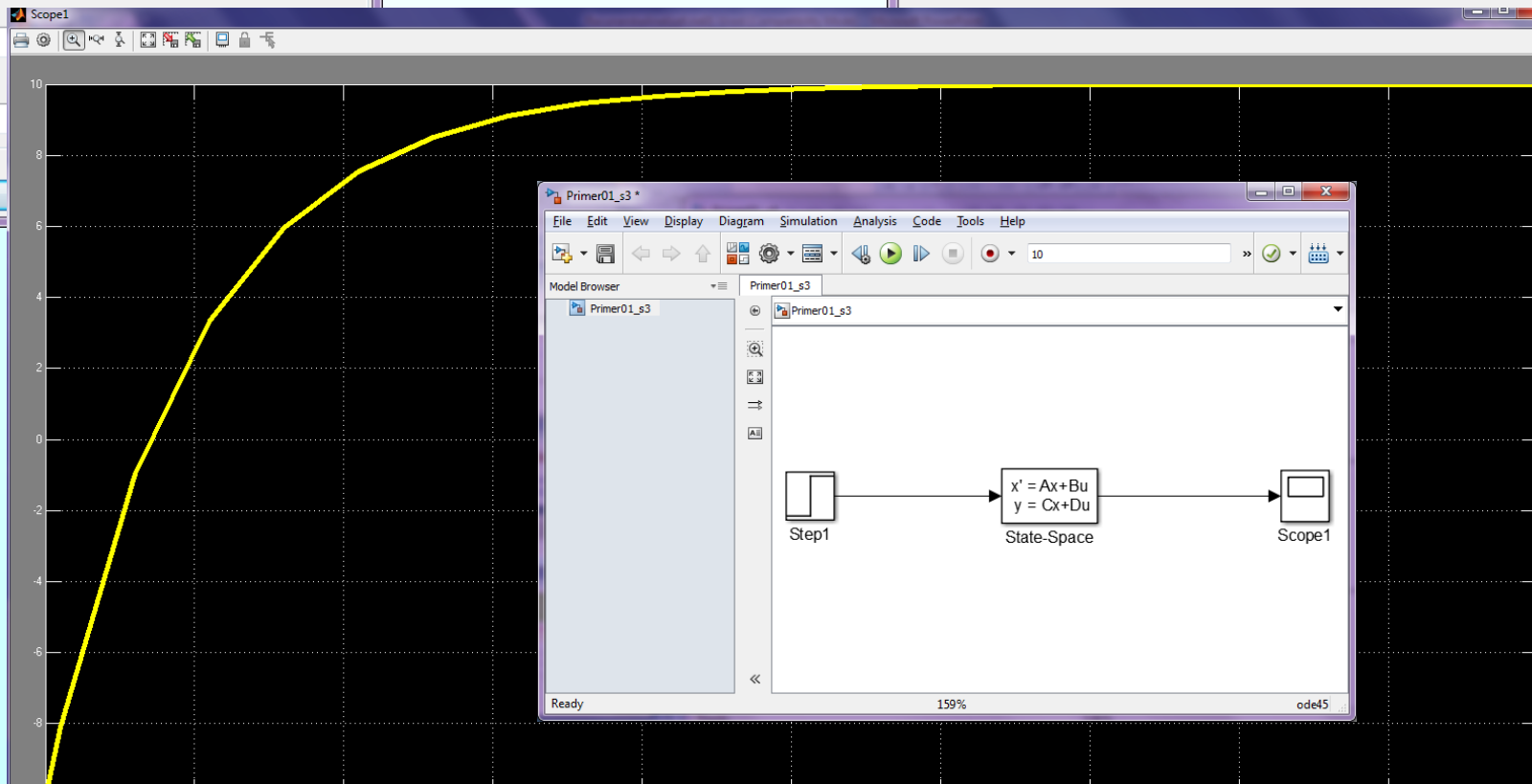
Initial value:

Final value:

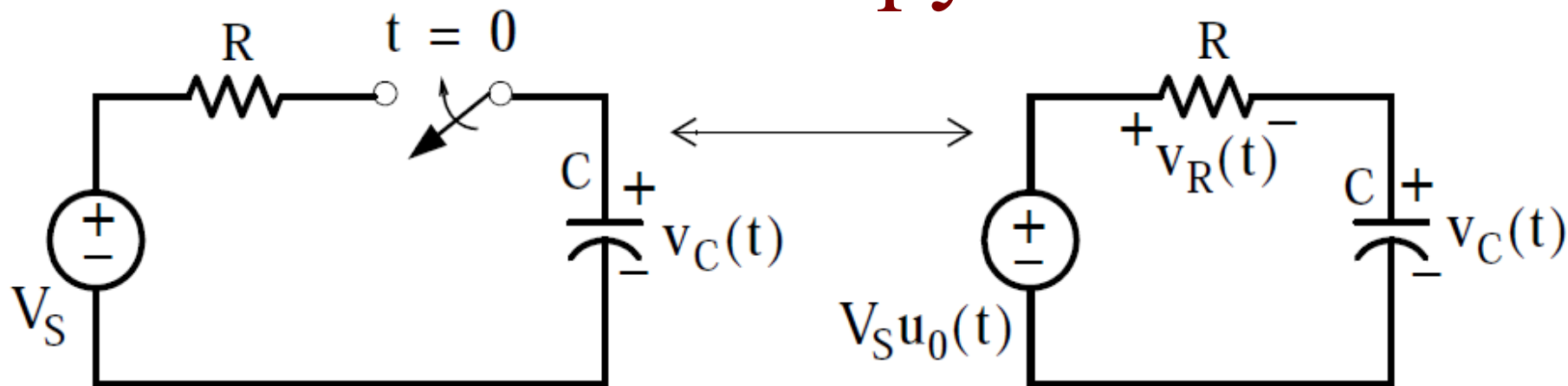
Sample time:

☒ Interpret vector parameters as 1-D

☒ Enable zero-crossing detection



Решимо “ручно”



$$v_R + v_C = V_S u_0(t)$$

$$i = i_C = C \frac{dv_C}{dt}$$

$$v_R = Ri = RC \frac{dv_C}{dt}$$

$$RC \frac{dv_C}{dt} + v_C = V_S u_0(t)$$

$$t > 0$$

$$RC \frac{dv_C}{dt} + v_C = V_S$$

$$v_C(t) = (V_S - V_S e^{-(1/RC)t}) u_0(t)$$

$$R = 1\text{k}\Omega$$

$$u_g(t) = U h(t), U = 10\text{ V}$$

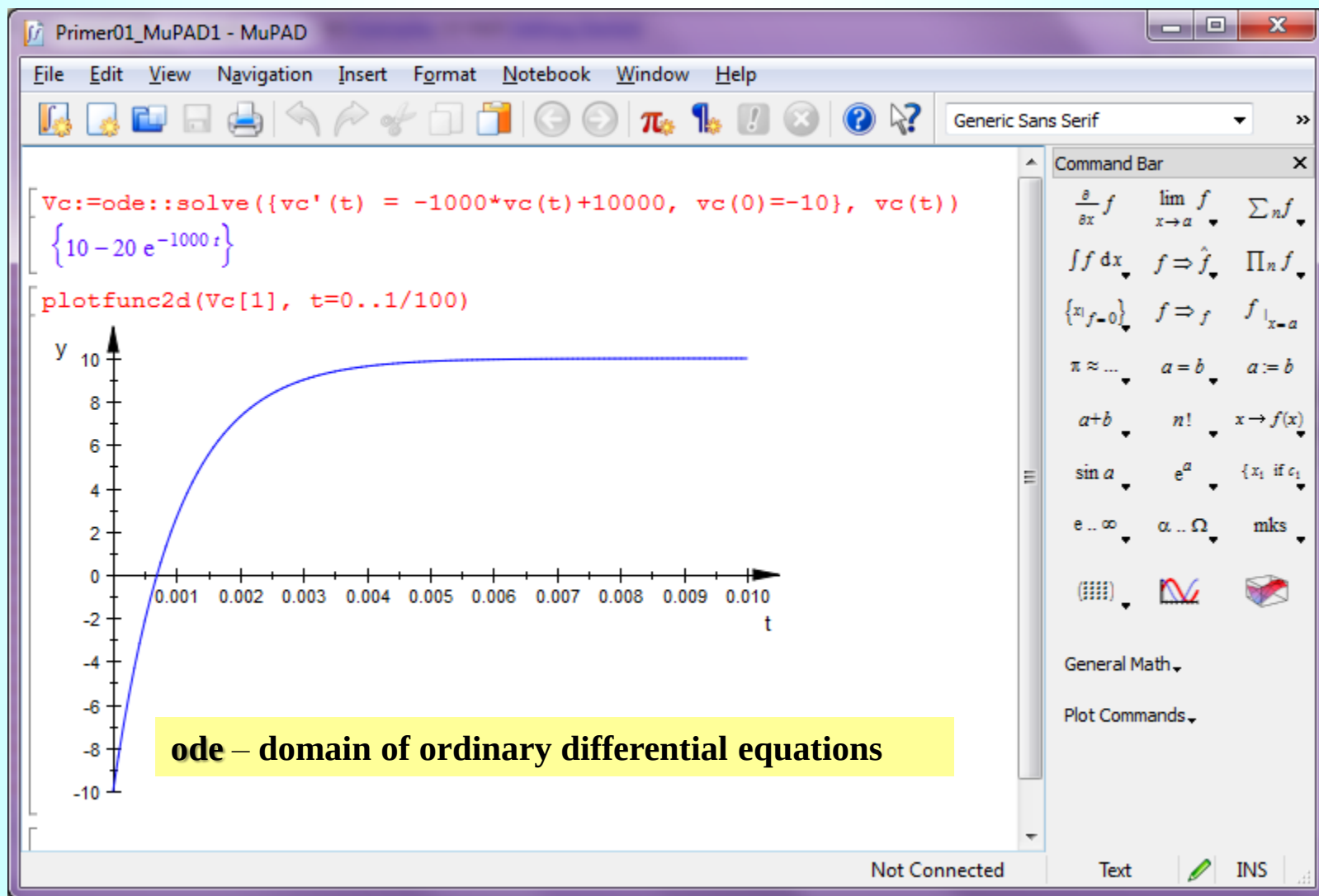
$$C = 1\mu\text{F}$$

$$u_C(t_0^-) = U_0 = -10\text{ V}$$

MuPAD

$$\frac{du_C(t)}{dt} = Au_C(t) + Bu_g(t) \Rightarrow A = -\frac{1}{RC} = -1000, B = 1000$$

mupad



Symbolic Math Toolbox

`syms vc(t)`

`Vc=dsolve(diff(vc)==-1000*vc+10000, vc(0)==-10)`

`ezplot(Vc, [0, 0.01])`

