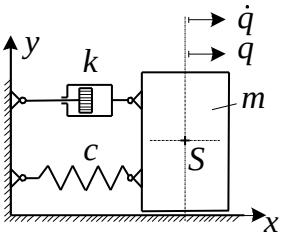
GÉPEK DINAMIKÁJA 5.gyak.hét – 1. és 2. Feladat

(kidolgozta: Dr. Nagy Zoltán egyetemi adjunktus)



$$m\ddot{q} + k\dot{q} + \frac{1}{c}q = 0,$$

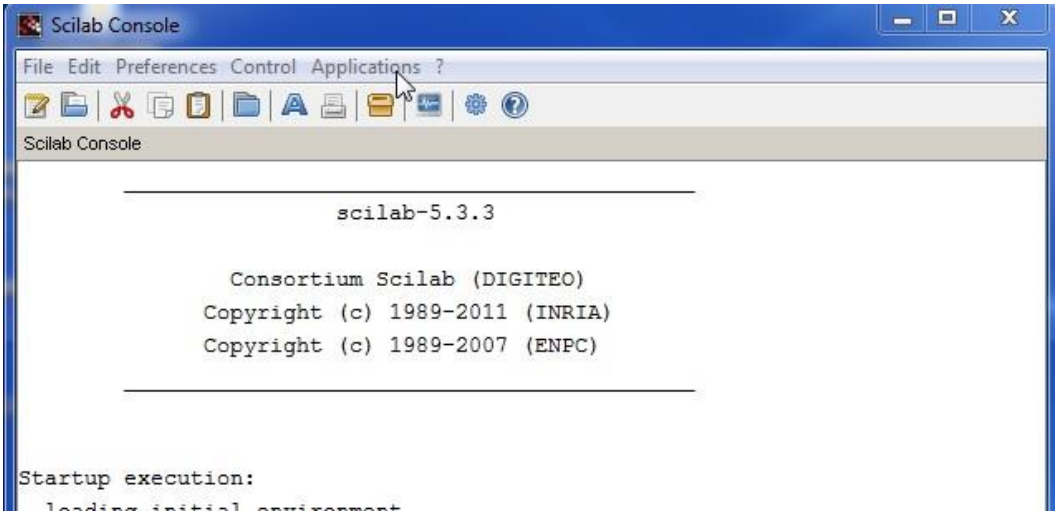
$$\ddot{q} = \frac{1}{m}\left(-k\dot{q} - \frac{1}{c}q\right) = -\frac{k}{m}\dot{q} - \frac{1}{cm}q = -\frac{0.9}{5}\dot{q} - \frac{1}{0.5\cdot 5}q = 0,$$

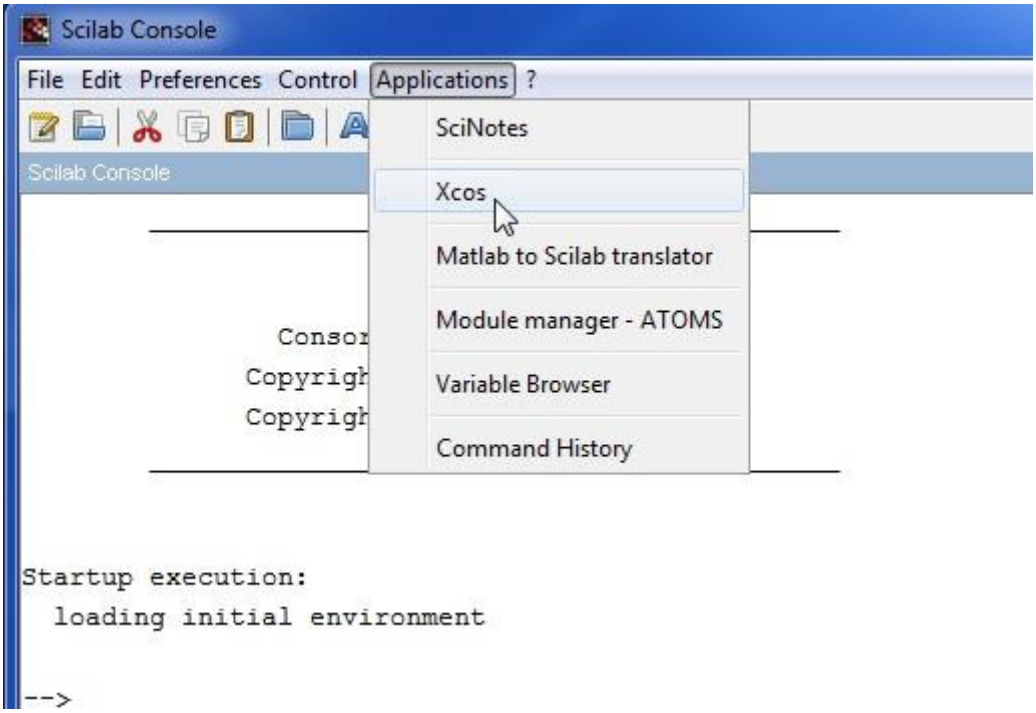
$$\ddot{q} = -\frac{0.9}{5}\dot{q} - \frac{2}{5}q. \quad (\textit{megoldandó differenciálegyenlet})$$

$$k = 0.9\ Ns/m\ ,\ c = 0.5\ m/N,\ m = 5\ kg\ .$$

$$\textit{Kezdeti feltételek}: q_0 = 1\ m\ ,\ \dot{q}_0 = 3\ m/s.$$

5.gyak.hét – 1. feladat (Analóg modell)




Scilab Console
File Edit Preferences Control Applications ?
SciNotes
Xcos
Matlab to Scilab translator
Module manager - ATOMS
Variable Browser
Command History
Scilab Console
Startup execution:
loading initial environment
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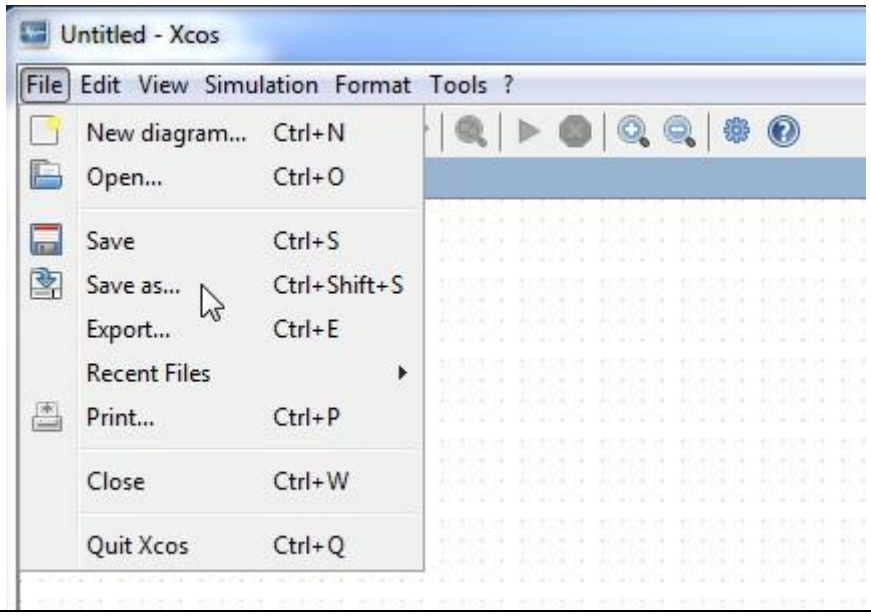
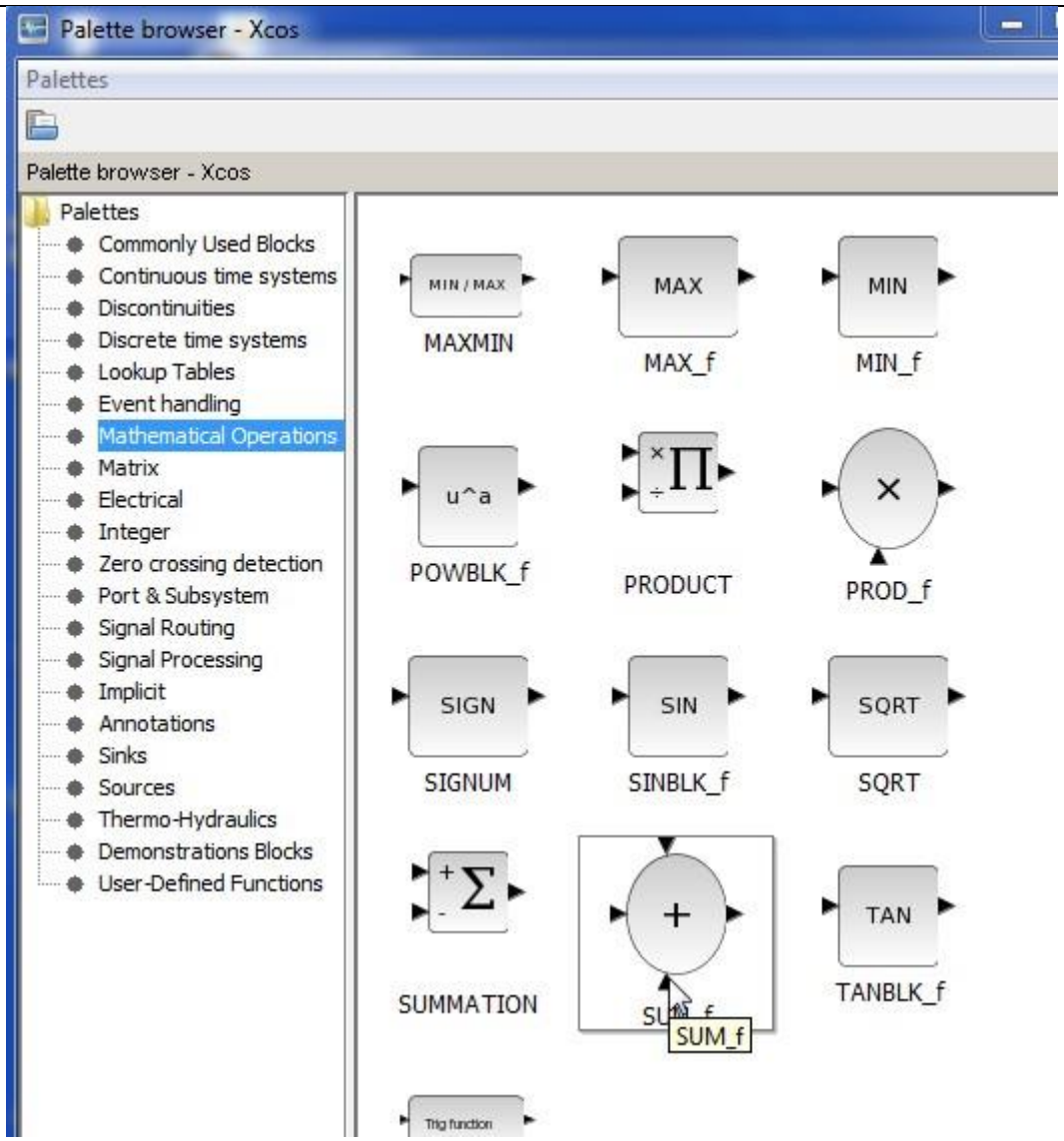
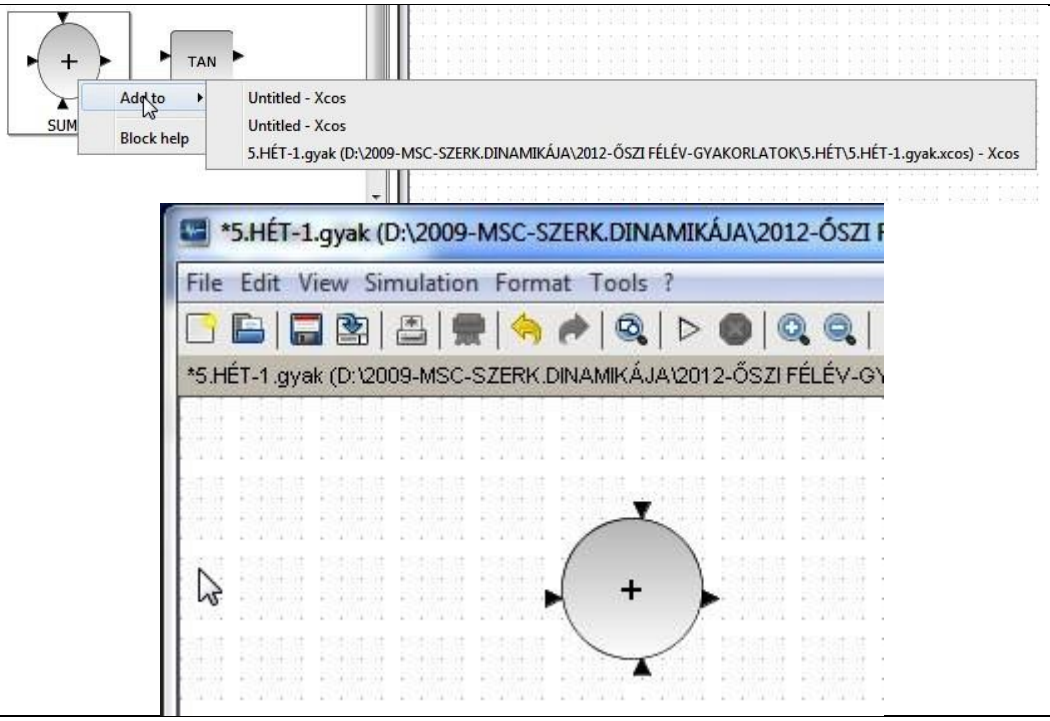

Untitled - Xcos
File Edit View Simulation Format Tools ?
New diagram... Ctrl+N
Open... Ctrl+O
Save Ctrl+S
Save as... Ctrl+Shift+S
Export... Ctrl+E
Recent Files
Print... Ctrl+P
Close Ctrl+W
Quit Xcos Ctrl+Q


Palette browser - Xcos
Palettes
Palette browser - Xcos
Palettes
Commonly Used Blocks
Continuous time systems
Discontinuities
Discrete time systems
Lookup Tables
Event handling
Mathematical Operations
Matrix
Electrical
Integer
Zero crossing detection
Port & Subsystem
Signal Routing
Signal Processing
Implicit
Annotations
Sinks
Sources
Thermo-Hydraulics
Demonstrations Blocks
User-Defined Functions
MIN / MAX
MAXMIN
MAX
MAX_f
MIN
MIN_f
u^a
POWBLK_f
PRODUCT
PROD_f
SIGN
SIGNUM
SIN
SINBLK_f
SQRT
SQRT
SUMMATION
SUM_f
TAN
TANBLK_f
Trig function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Add to
Block help
Untitled - Xcos
Untitled - Xcos
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*5.HÉT-1.gyak (D:\2009-MSC-SZERK.DINAMIKÁJA\2012-ŐSZI
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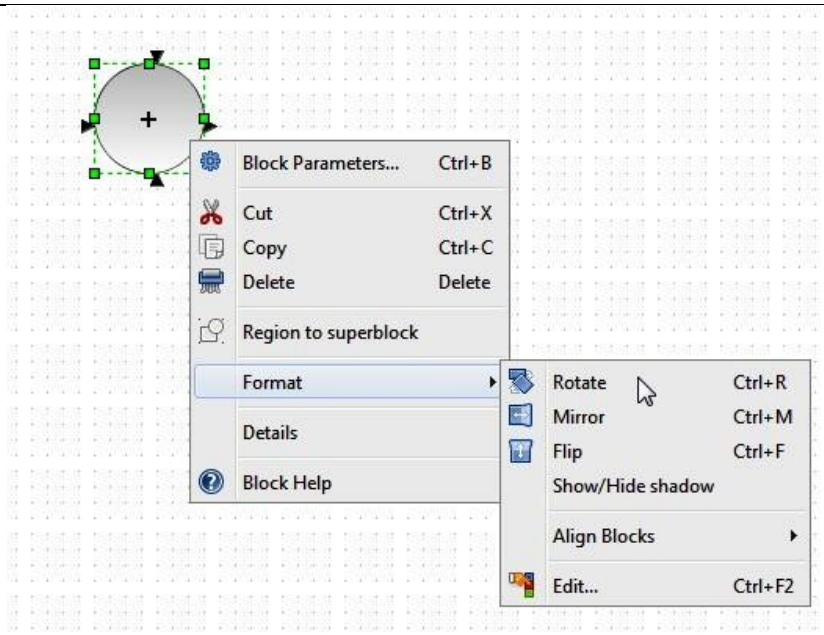
*5.HÉT-1.gyak (D:\2009-MSC-SZERK.DINAMIKÁJA\2012-ŐSZI FÉLÉV-G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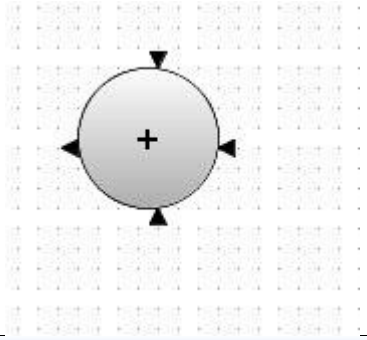
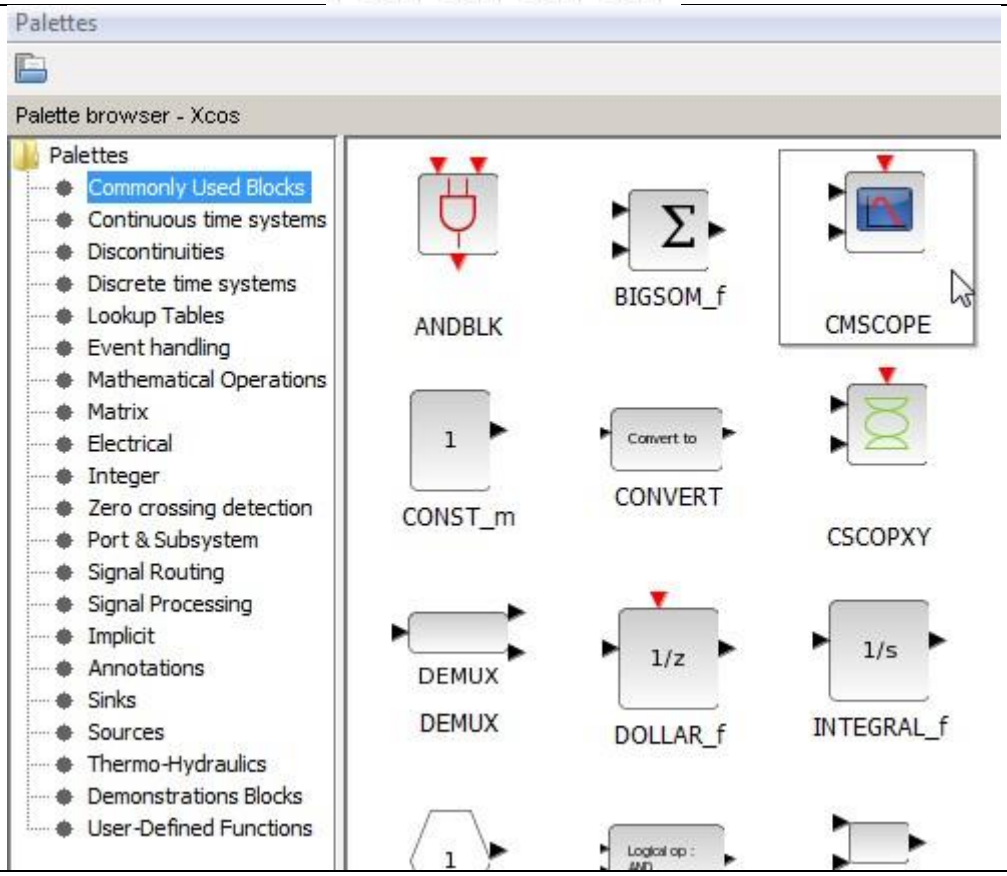
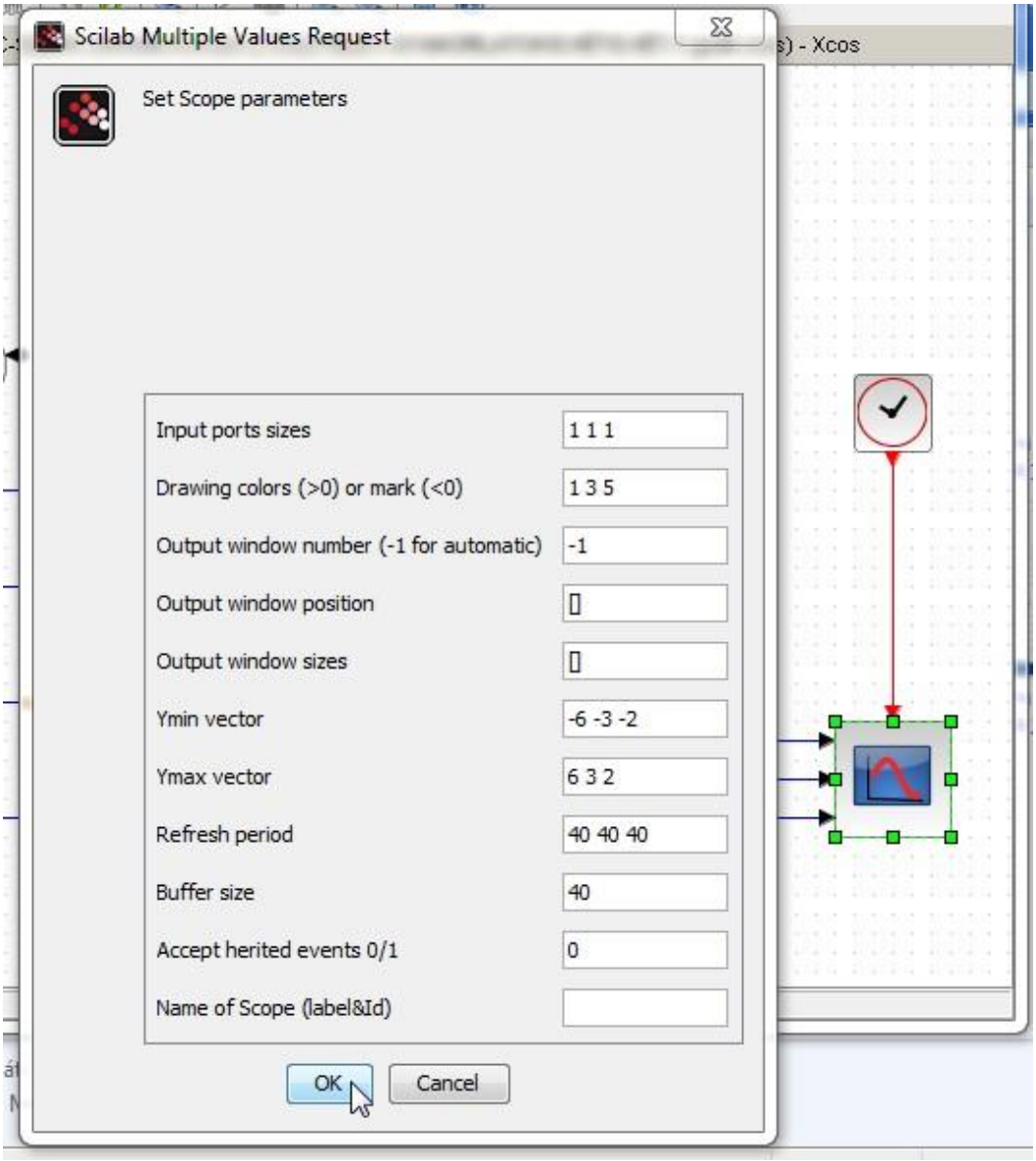
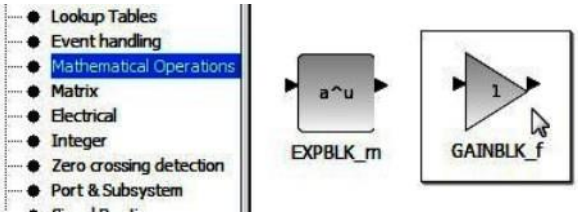
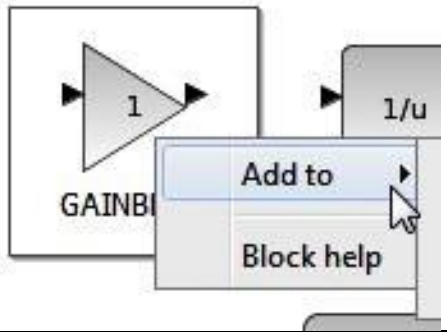
Cut Ctrl+X
Copy Ctrl+C
Delete Delete
Region to superblock
Format
Details
Block Help
Rotate Ctrl+R
Mirror Ctrl+M
Flip Ctrl+F
Show/Hide shadow
Align Blocks
Edit... Ctrl+F2




Palettes
Palette browser - Xcos
Palettes
Commonly Used Blocks
Continuous time systems
Discontinuities
Discrete time systems
Lookup Tables
Event handling
Mathematical Operations
Matrix
Electrical
Integer
Zero crossing detection
Port & Subsystem
Signal Routing
Signal Processing
Implicit
Annotations
Sinks
Sources
Thermo-Hydraulics
Demonstrations Blocks
User-Defined Functions
ANDBLK
BIGSOM_f
CMSCOPE
CONST_m
CONVERT
CSCOPXY
DEMUX
DEMUX
DOLLAR_f
INTEGRAL_f


Scilab Multiple Values Request
Set Scope parameters
Input ports sizes
1 1 1
Drawing colors (>0) or mark (<0)
1 3 5
Output window number (-1 for automatic)
-1
Output window position
[]
Output window sizes
[]
Ymin vector
-6 -3 -2
Ymax vector
6 3 2
Refresh period
40 40 40
Buffer size
40
Accept herited events 0/1
0
Name of Scope (label&Id)
OK
Cancel
s) - Xcos


Lookup Tables
Event handling
Mathematical Operations
Matrix
Electrical
Integer
Zero crossing detection
Port & Subsystem
a^u
EXPBLK_m
1
GAINBLK_f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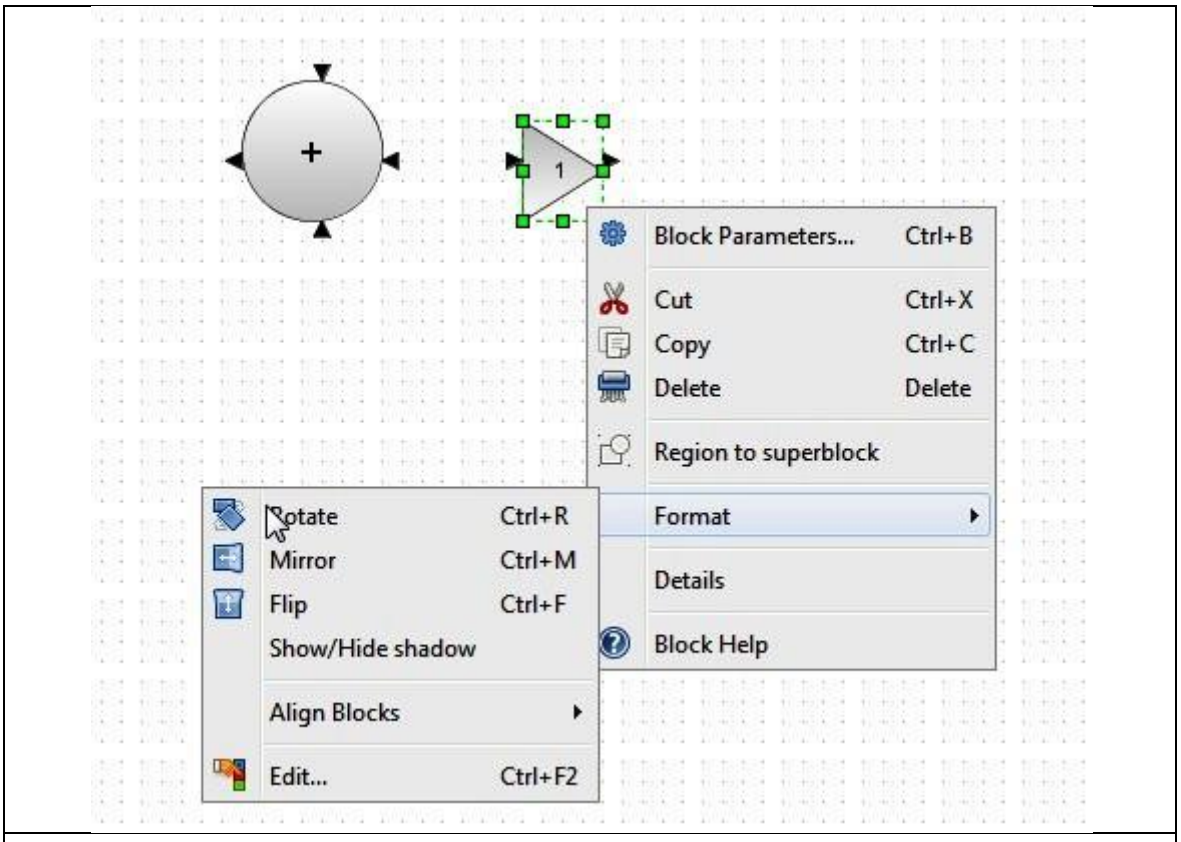
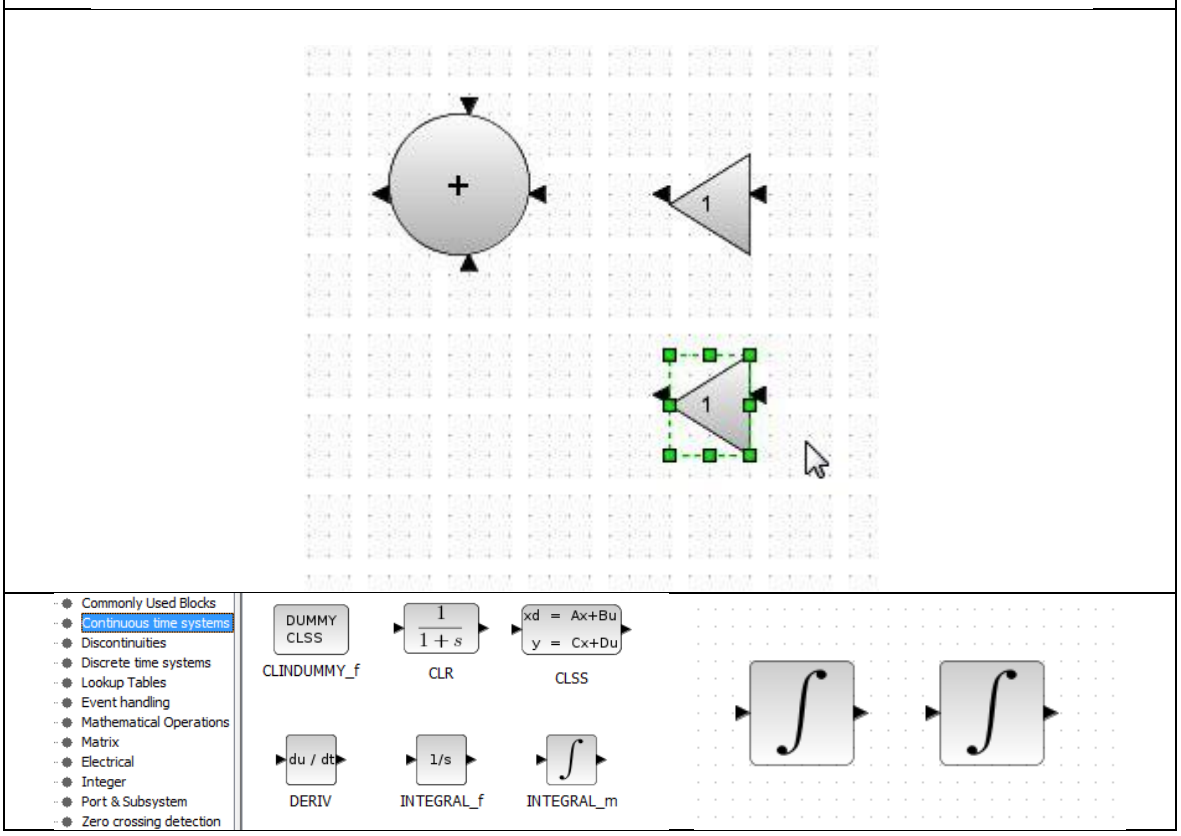
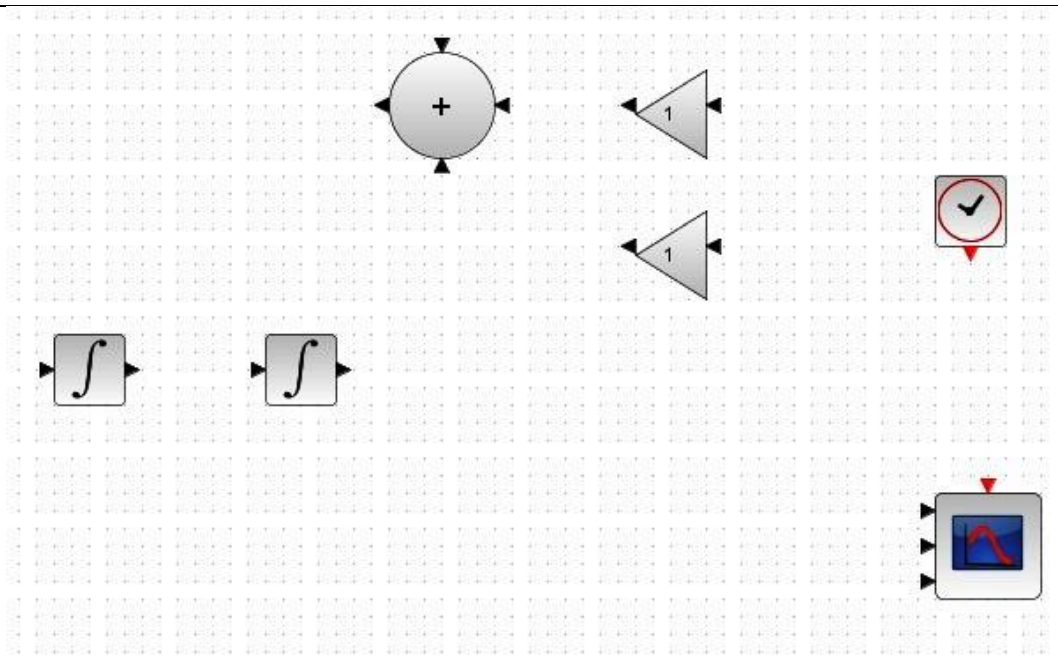
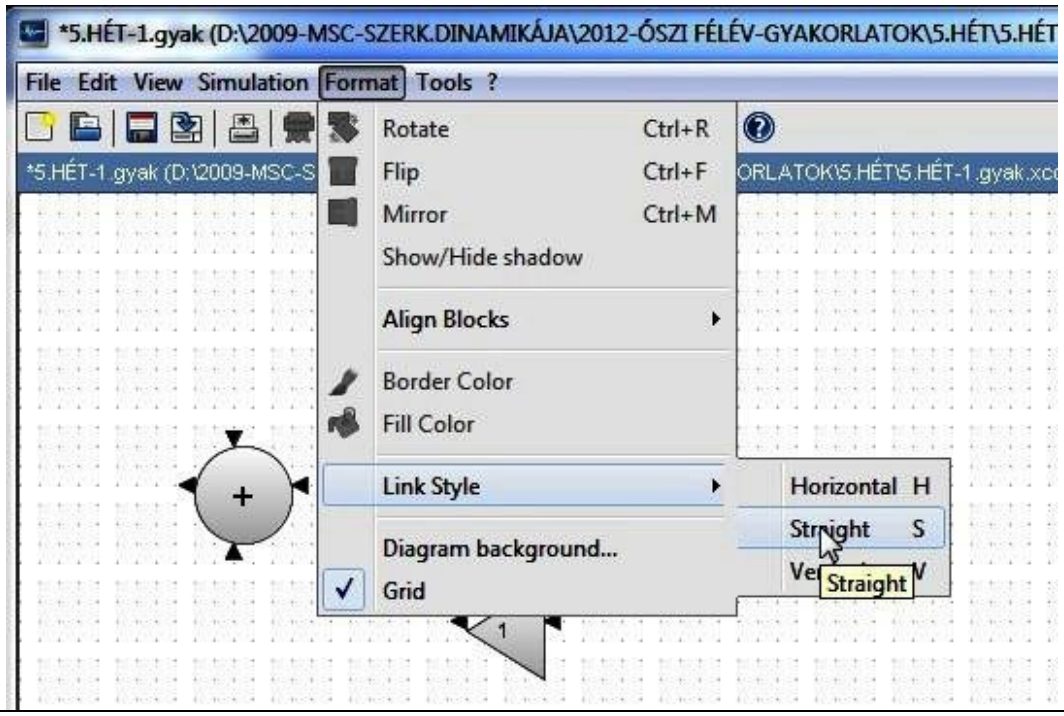
1/u
Add to
Block help


Block Parameters... Ctrl+B
Cut Ctrl+X
Copy Ctrl+C
Delete Delete
Region to superblock
Format
Details
Block Help
Rotate Ctrl+R
Mirror Ctrl+M
Flip Ctrl+F
Show/Hide shadow
Align Blocks
Edit... Ctrl+F2


Commonly Used Blocks
Continuous time systems
Discontinuities
Discrete time systems
Lookup Tables
Event handling
Mathematical Operations
Matrix
Electrical
Integer
Port & Subsystem
Zero crossing detection
DUMMY CLSS
CLINDUMMY_f
CLR
xd = Ax+Bu
y = Cx+Du
CLSS
du / dt
DERIV
1/s
INTEGRAL_f
INTEGRAL_m




*5.HÉT-1.gyak (D:\2009-MSC-SZERK.DINAMIKÁJA\2012-ŐSZI FÉLÉV-GYAKORLATOK\5.HÉT\5.HÉT
File Edit View Simulation Format Tools ?
Rotate Ctrl+R
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Mirror Ctrl+M
Show/Hide shadow
Align Blocks
Border Color
Fill Color
Link Style
Diagram background...
Grid
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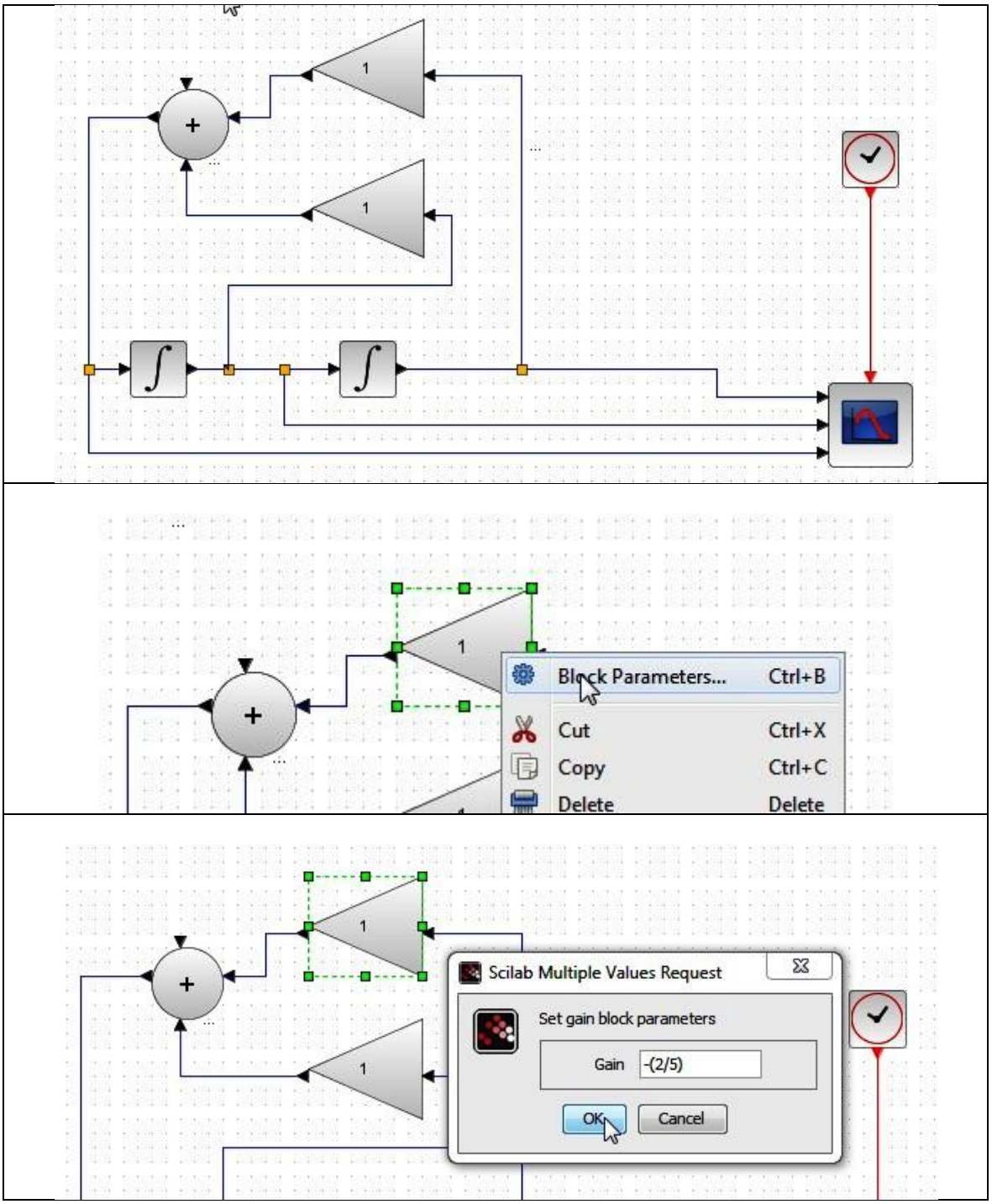
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Block Parameters... Ctrl+B
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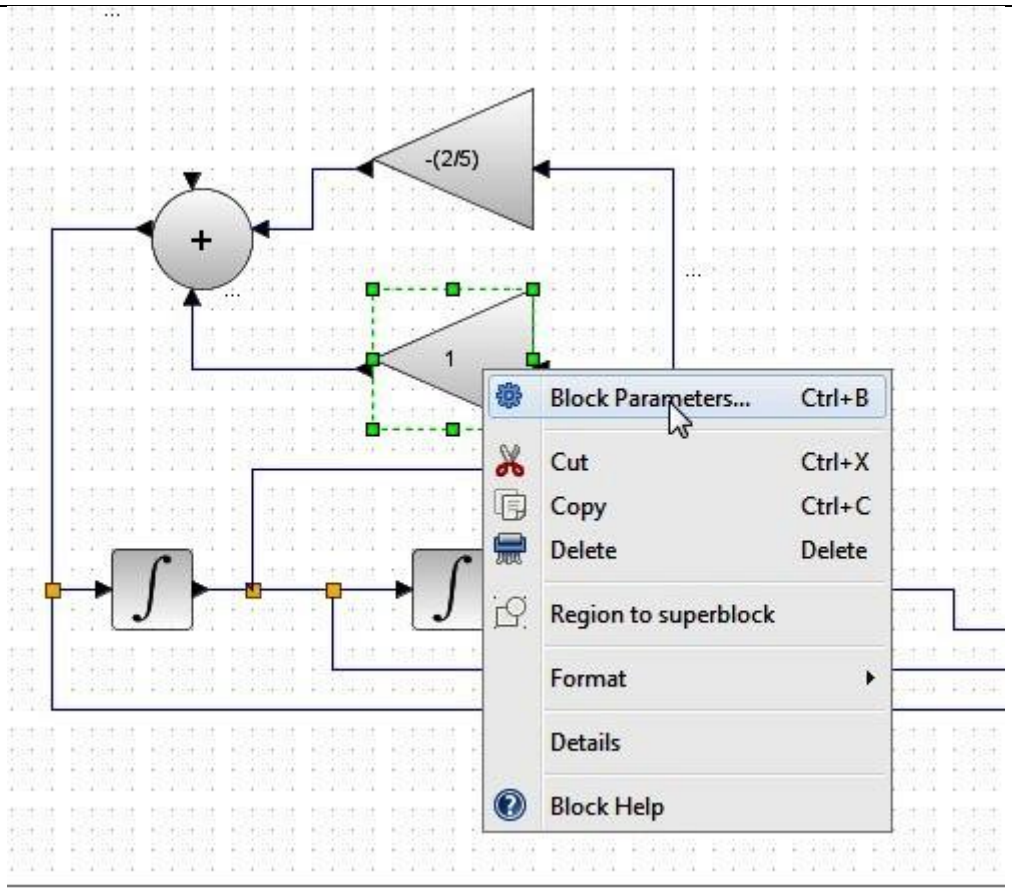
Delete Delete
Scilab Multiple Values Request
Set gain block parameters
Gain -(2/5)
OK
Cancel


-(2/5)
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Block Parameters... Ctrl+B
Cut Ctrl+X
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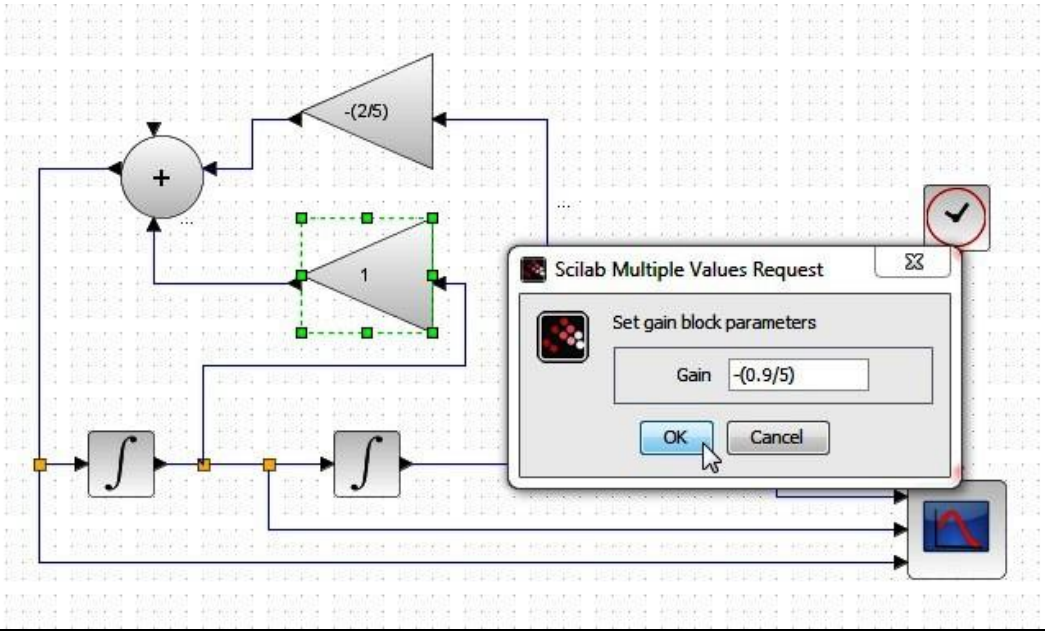
Delete Delete
Region to superblock
Format
Details
Block Help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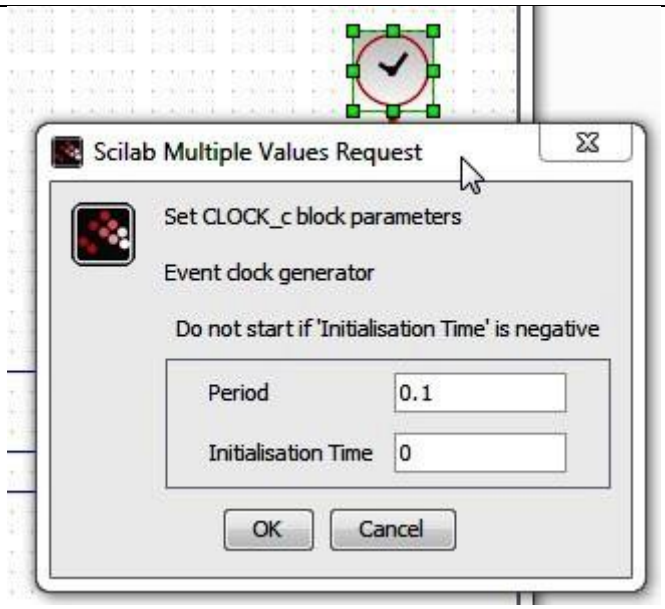
1
Scilab Multiple Values Request
Set gain block parameters
Gain
-(0.9/5)
OK
Cancel


Scilab Multiple Values Request
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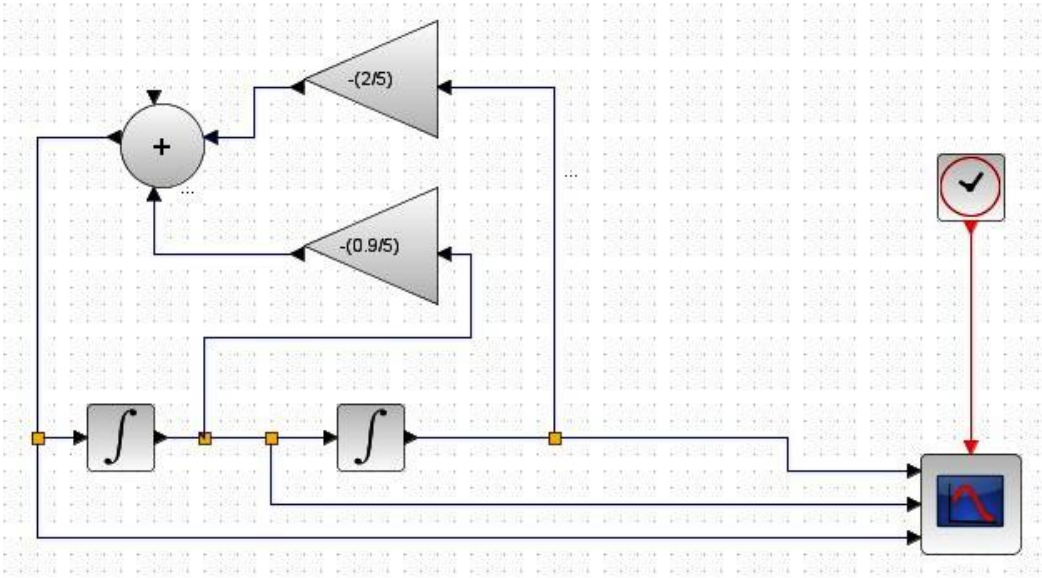
Event clock generator
Do not start if 'Initialisation Time' is negative
Period
0.1
Initialisation Time
0
OK
Cancel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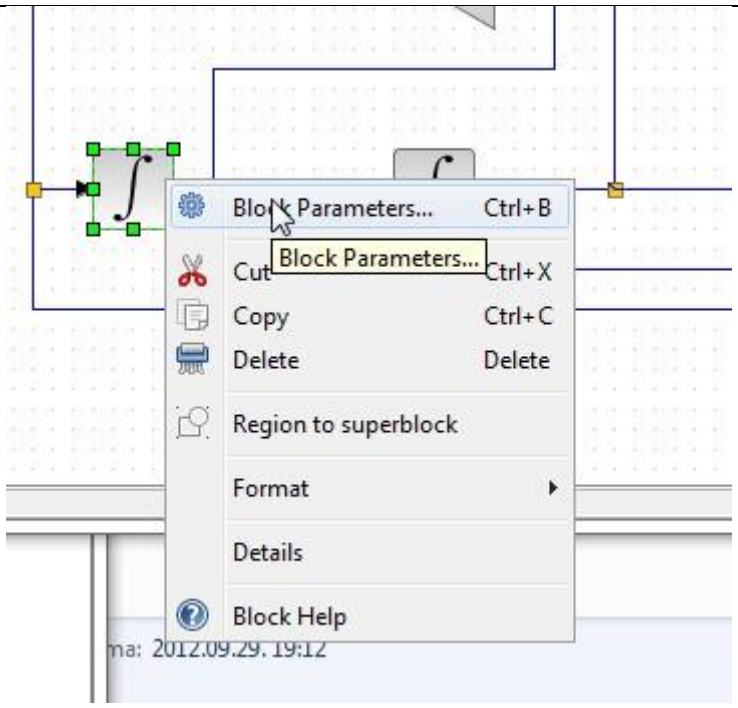
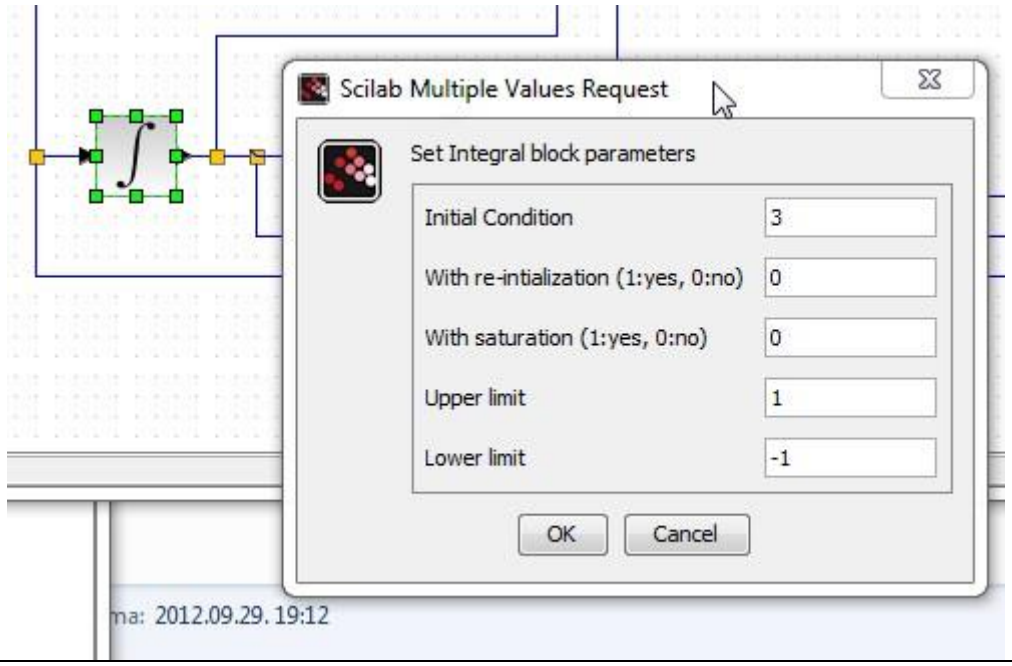
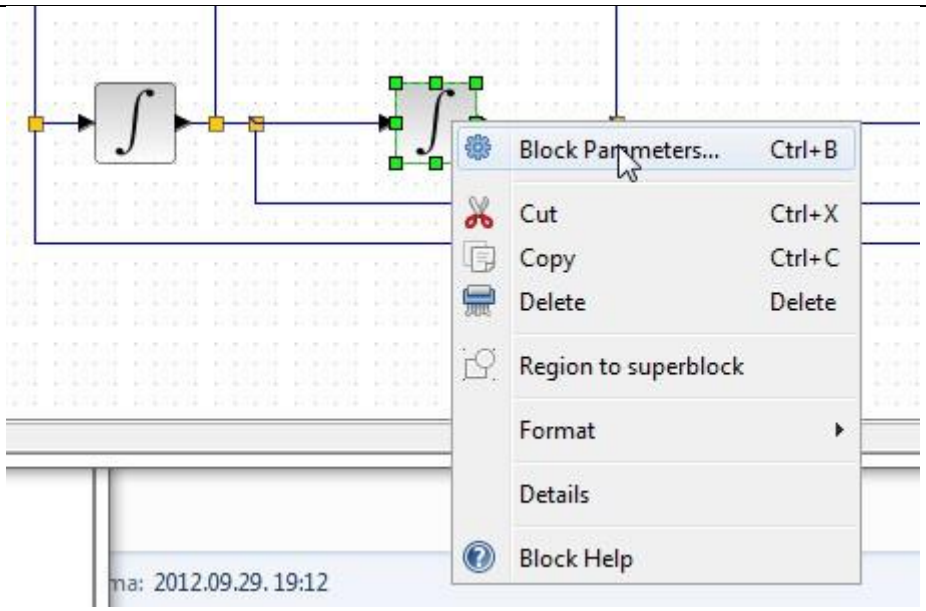
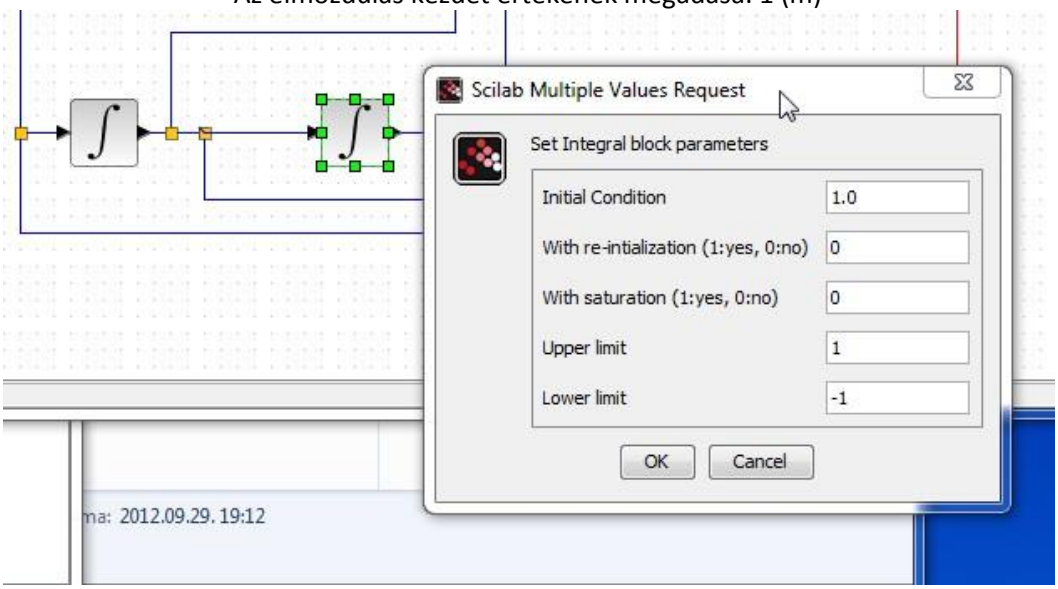


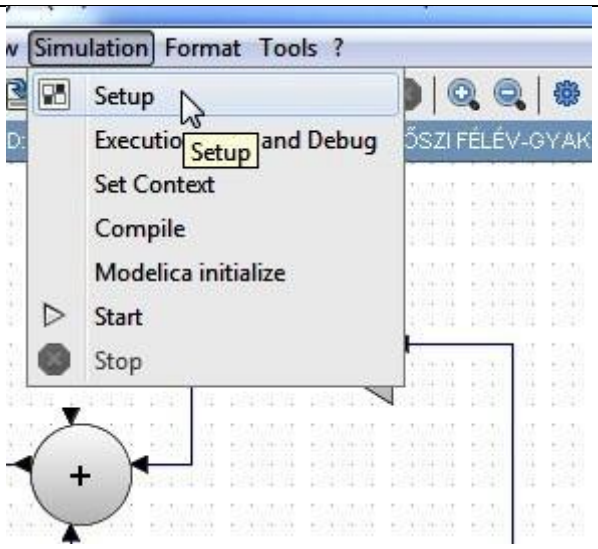
Sebesség kezdeti értékének megadása: 3 (m/s)



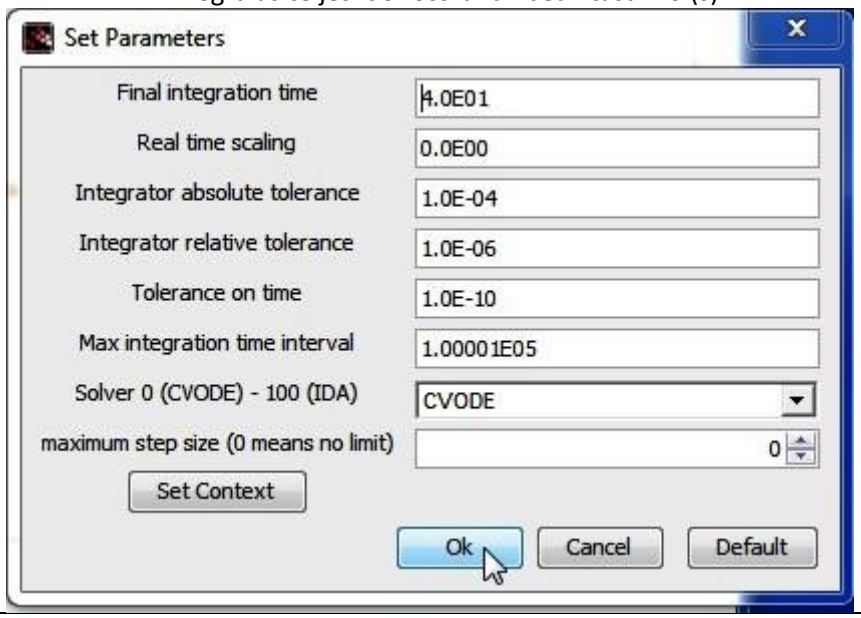


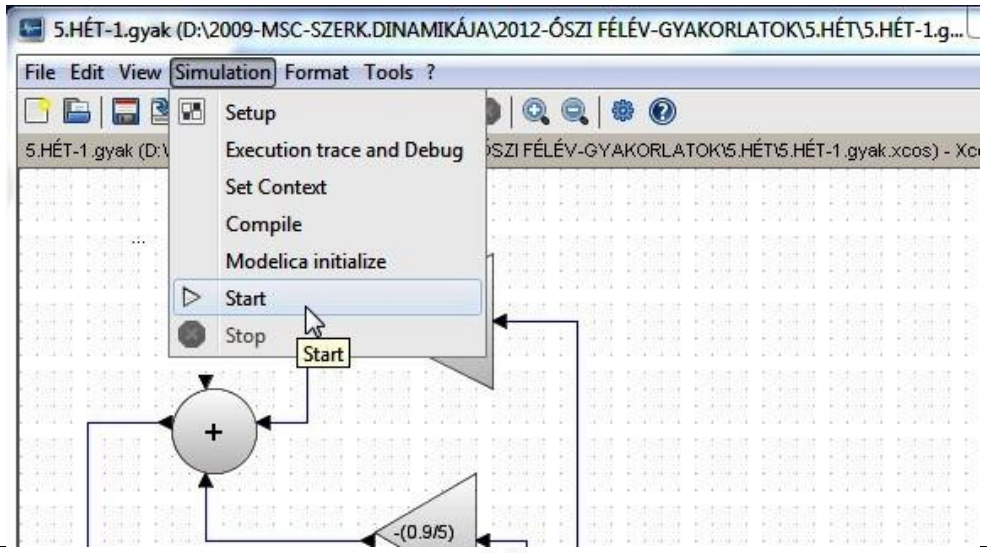
Az elmozdulás kezdet értékének megadása: 1 (m)

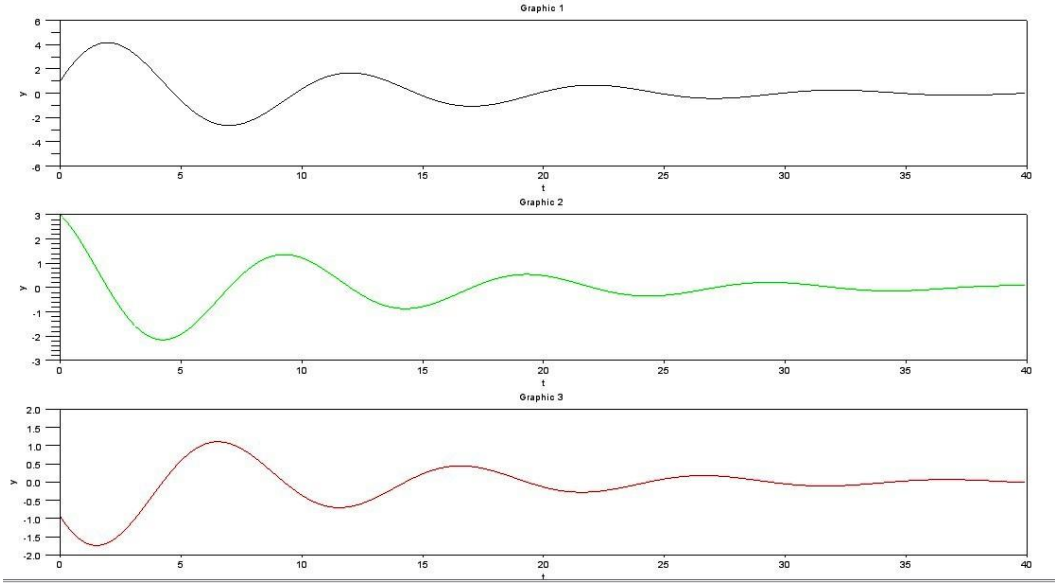




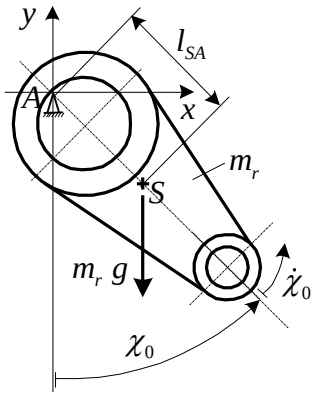
Az inegrálás teljes időhosszának beállítása: 40 (s)







5.gyak.hét – 2. feladat („ ANALÓG” modell)



$$J_{AZ}\,\ddot{\chi} = -l_{SA}\,m_r\,g\,sin\chi\,,$$

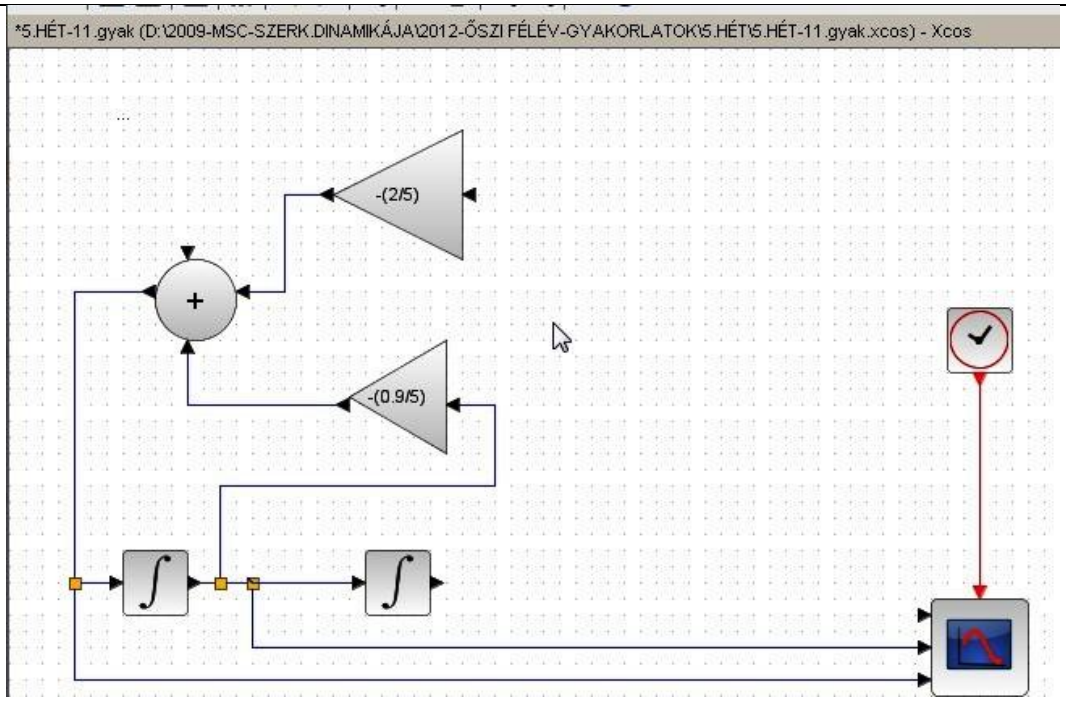
$$\ddot{\chi} = -\frac{l_{SA}\,m_r\,g}{J_{AZ}}\,sin\chi \quad (rad/s^2) \quad \textit{szöggyorsulás.}$$

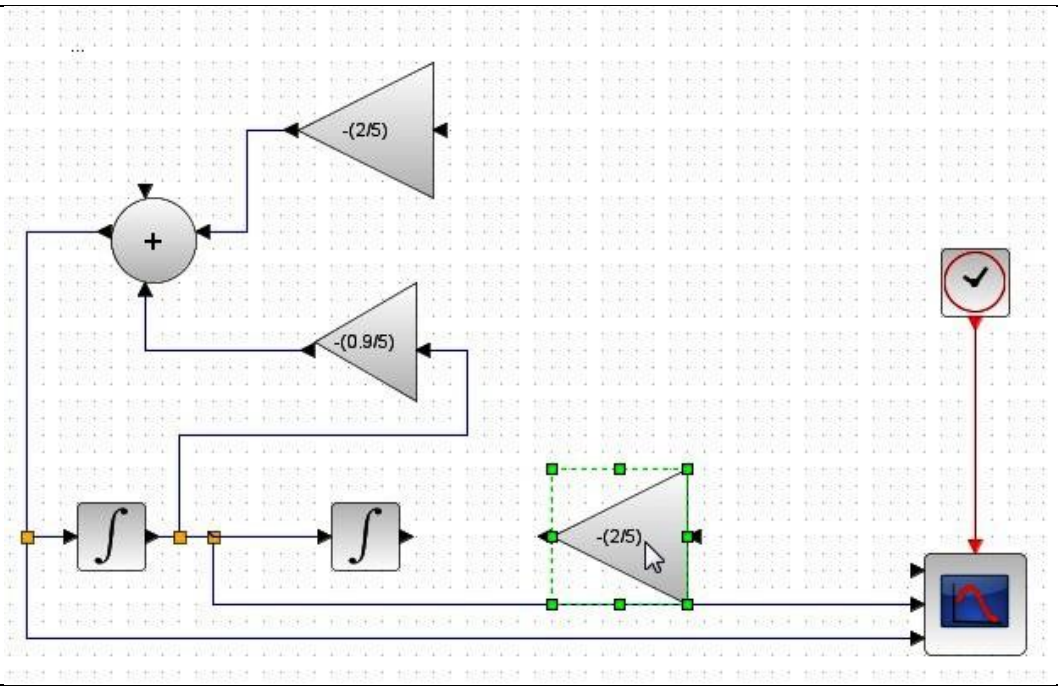
$$l_{SA} = 0{,}15\ m \quad , \quad J_{AZ} = 0{,}05\ kgm^2,$$

$$m_r = 0{,}45\ kg\ , \quad g = 10\ m/s^2\ .$$

$$Kezdeti\ \ feltételek: \chi_0 = 120^0\ ,\ \dot{\chi}_0 = 0{,}5\ rad/s.$$

Az előző feladat megoldását megnyitjuk, majd más néven lementjük.
Ezt megnyitva **a felesleges összeköttetéseket töröljük** (lásd alábbi ábrát).
Vigyázat! Ekkor az egyes műveleti erősítők még az előző feladat értékeit tartalmazzák, melyeket a mostani feladatnak megfelelően később felül írunk!!!!




-(2/5)
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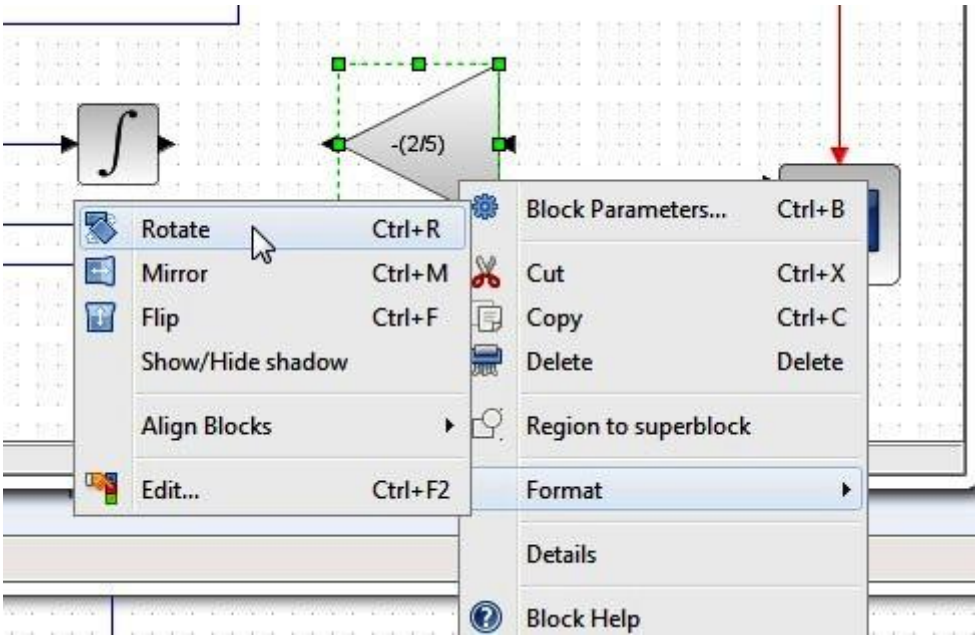
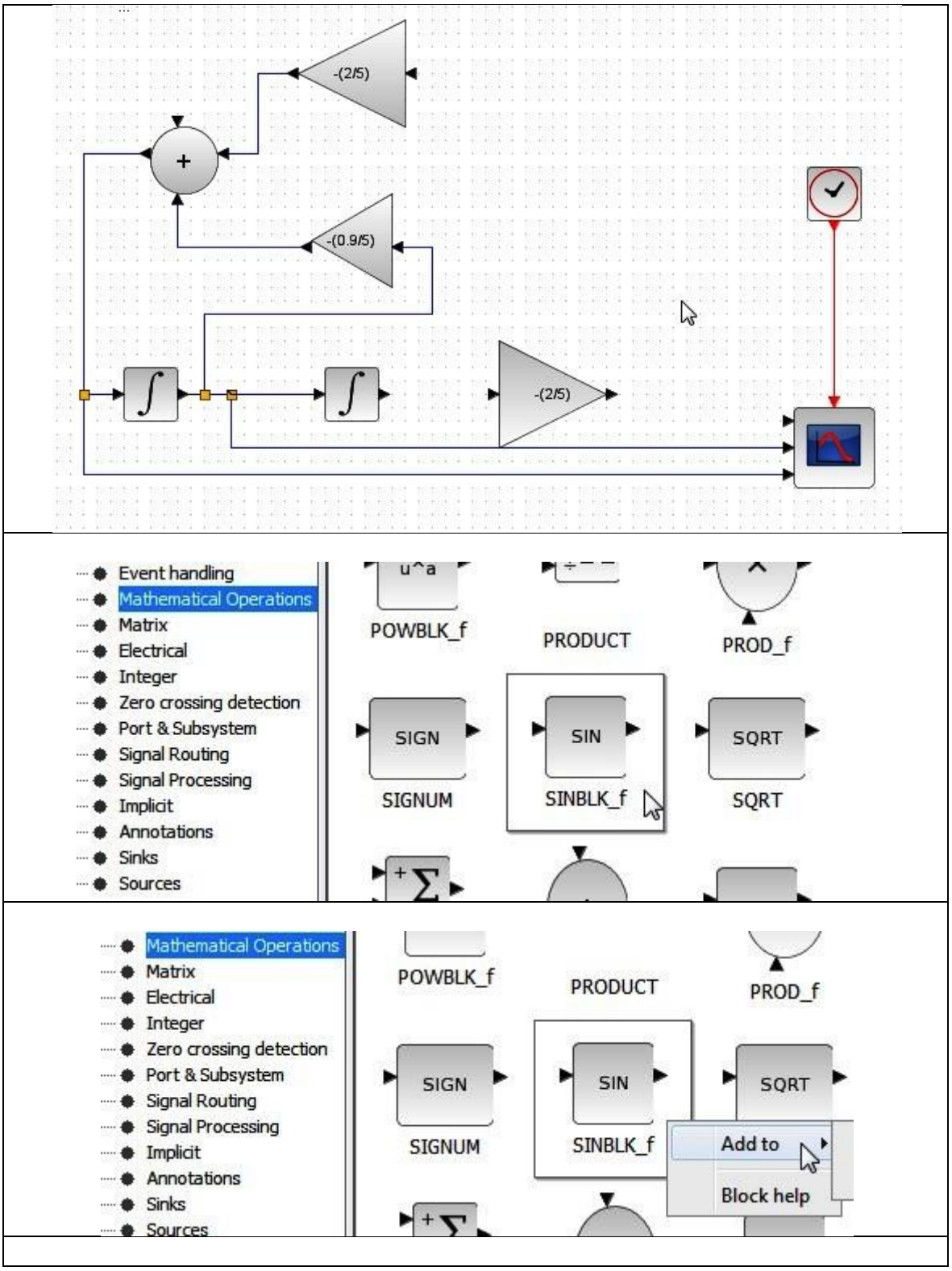

-(2/5)
Rotate Ctrl+R
Mirror Ctrl+M
Flip Ctrl+F
Show/Hide shadow
Align Blocks
Edit... Ctrl+F2
Block Parameters... Ctrl+B
Cut Ctrl+X
Copy Ctrl+C
Delete Delete
Region to superblock
Format
Details
Block Help


-(2/5)
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Event handling
Mathematical Operations
Matrix
Electrical
Integer
Zero crossing detection
Port & Subsystem
Signal Routing
Signal Processing
Implicit
Annotations
Sinks
Sources
POWBLK_f
PRODUCT
PROD_f
SIGN
SIGNUM
SIN
SINBLK_f
SQRT
SQRT
Mathematical Operations
Matrix
Electrical
Integer
Zero crossing detection
Port & Subsystem
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Signal Processing
Implicit
Annotations
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Sources
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PRODUCT
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SIGN
SIGNUM
SIN
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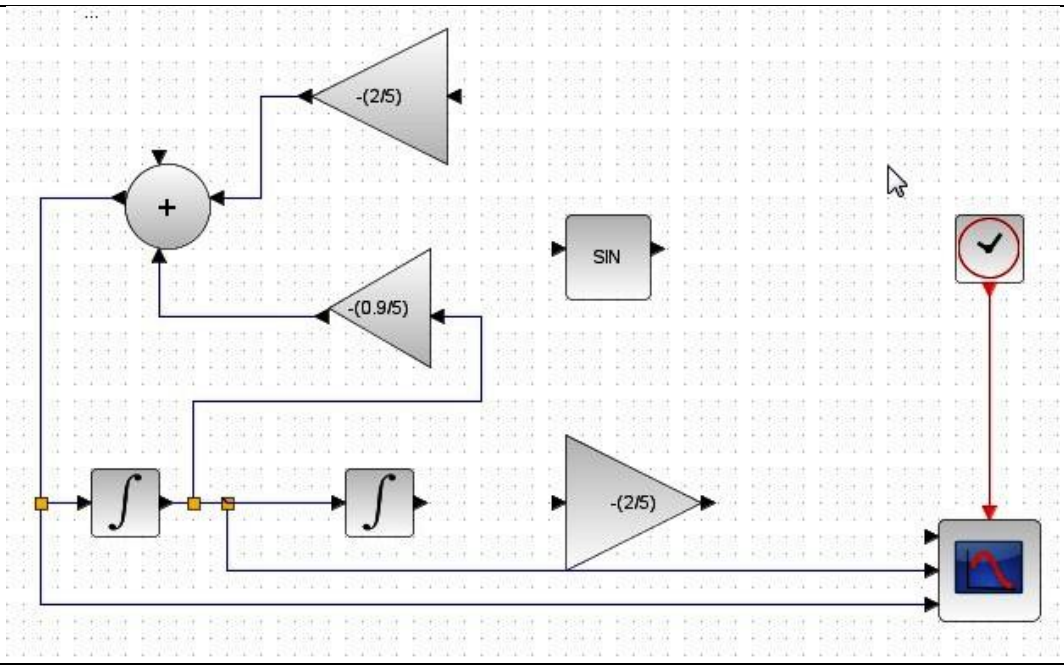
SQRT
Add to
Block help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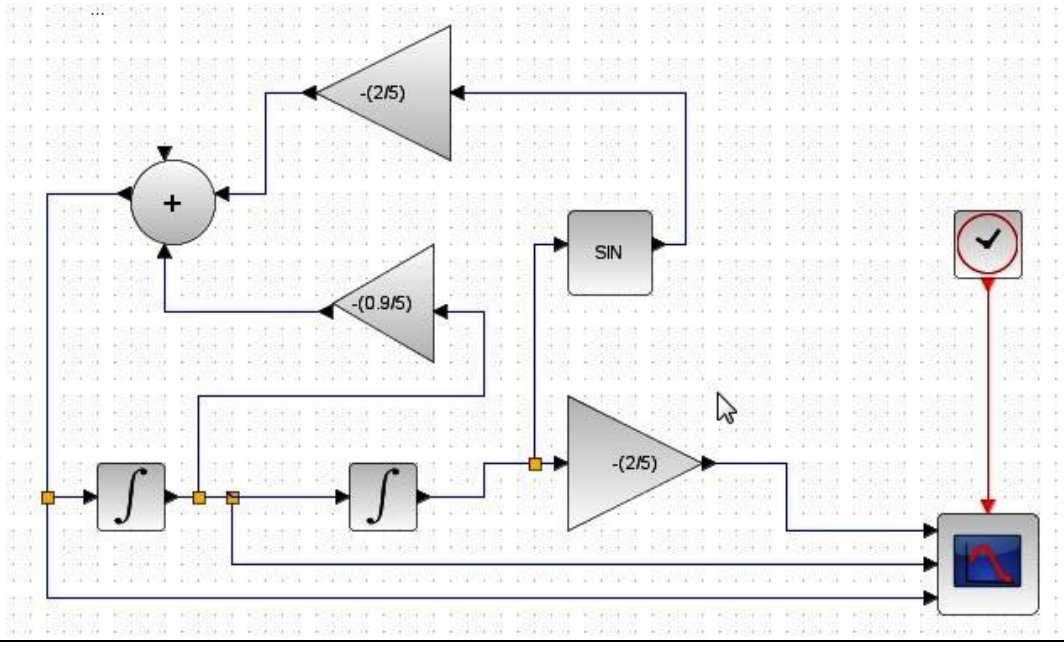
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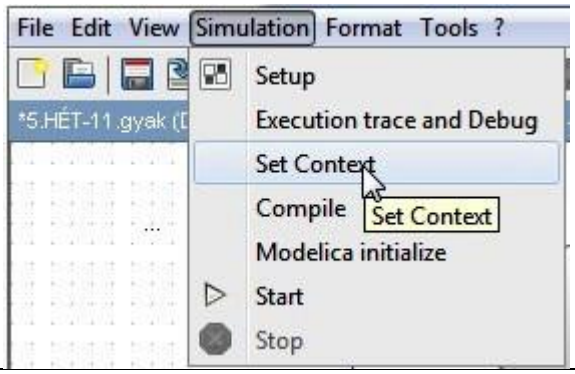
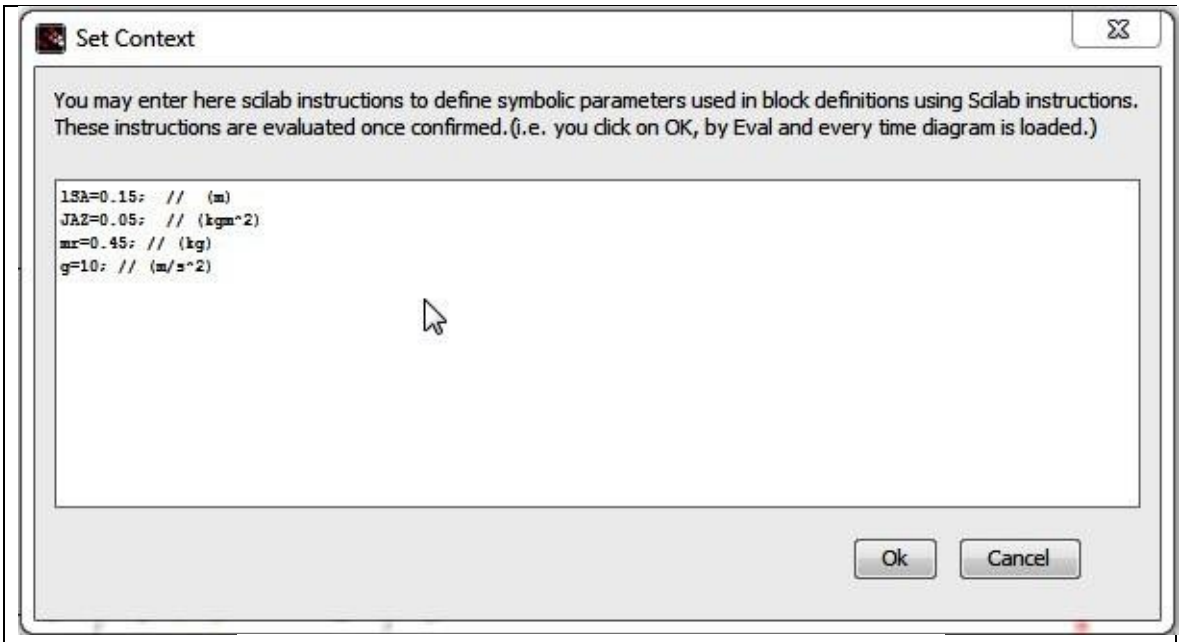
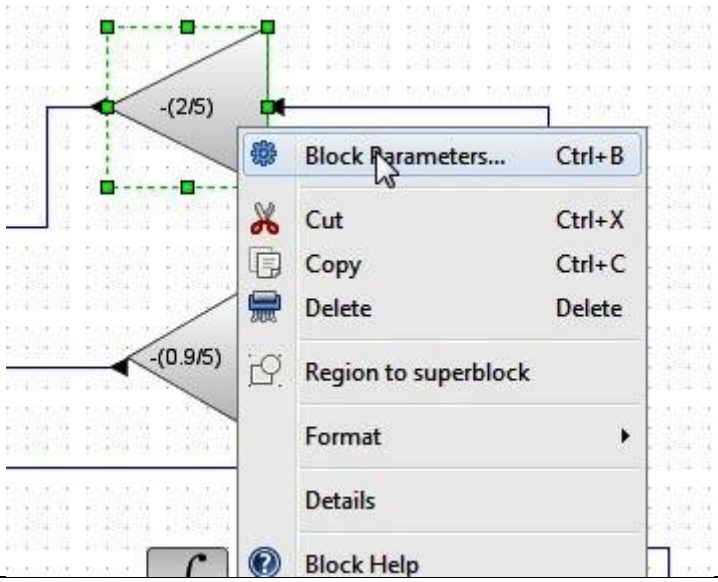
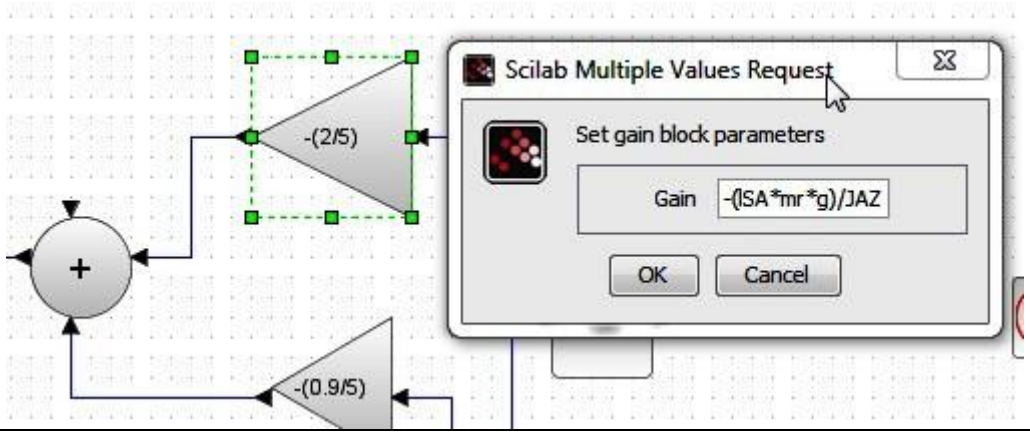
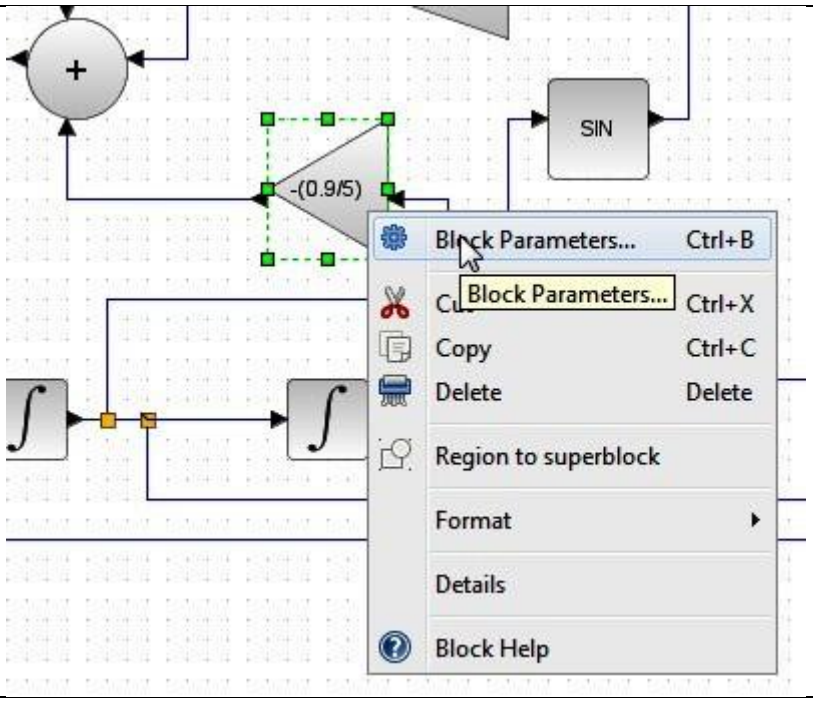
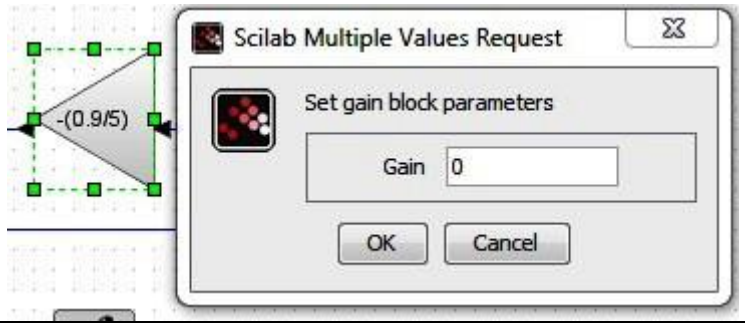

File Edit View Simulation Format Tools ?
*5.HÉT-11.gyak
Setup
Execution trace and Debug
Set Context
Compile
Set Context
Modelica initialize
Start
Stop

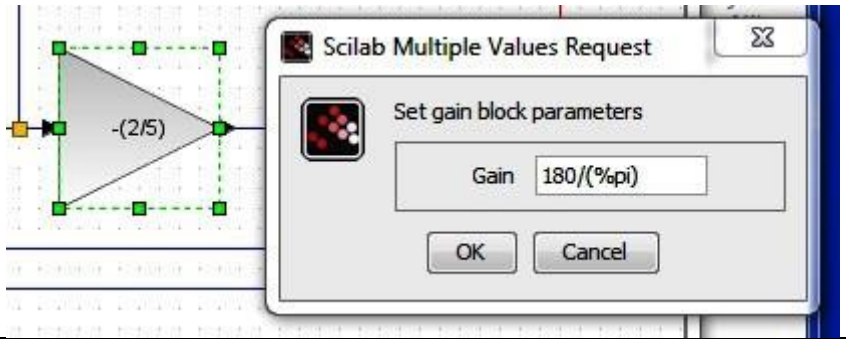

Set Context
You may enter here scilab instructions to define symbolic parameters used in block definitions using Scilab instructions.
These instructions are evaluated once confirmed.(i.e. you click on OK, by Eval and every time diagram is loaded.)
lSA=0.15; // (m)
JAZ=0.05; // (kgm^2)
mr=0.45; // (kg)
g=10; // (m/s^2)
Ok
Cancel


-(2/5)
-(0.9/5)
Block Parameters... Ctrl+B
Cut Ctrl+X
Copy Ctrl+C
Delete Delete
Region to superblock
Format
Details
Block Help

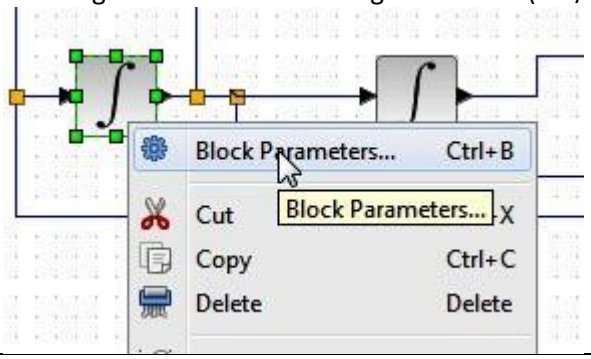

-(2/5)
+
-(0.9/5)
Scilab Multiple Values Request
Set gain block parameters
Gain
-(lSA*mr*g)/JAZ
OK
Cancel

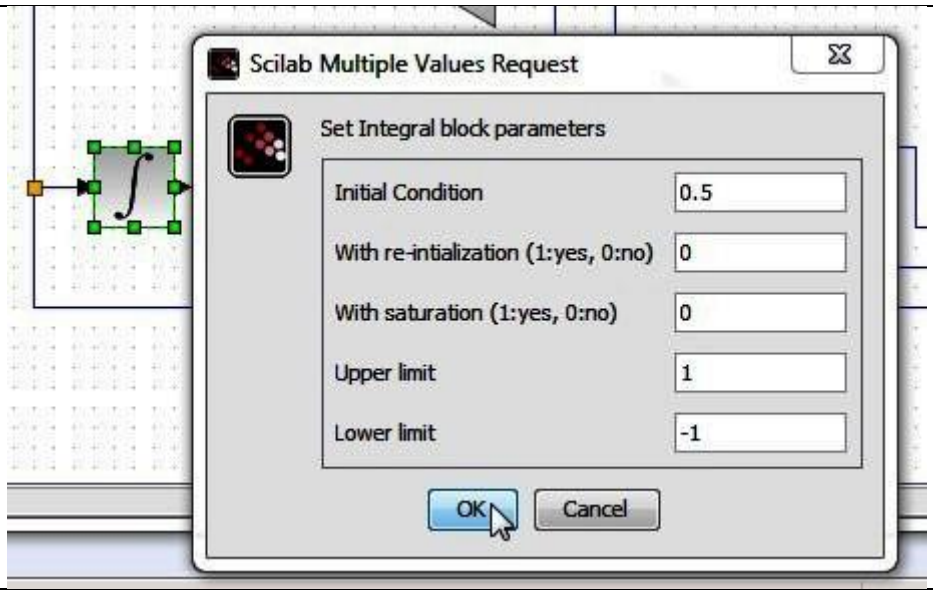




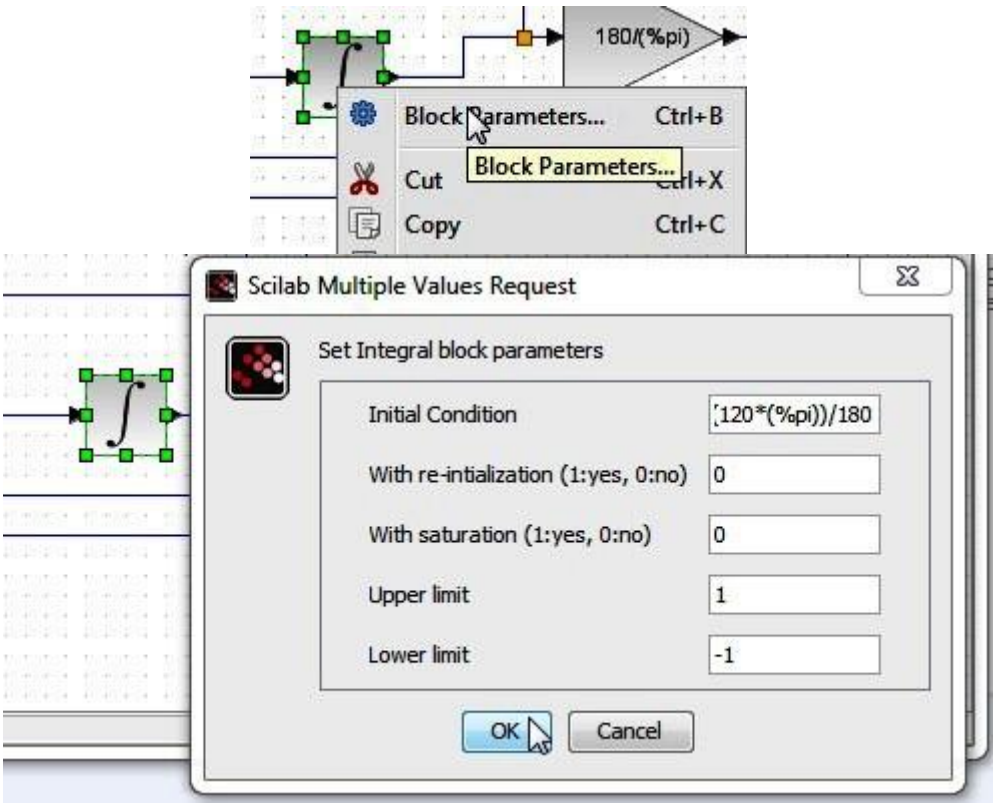


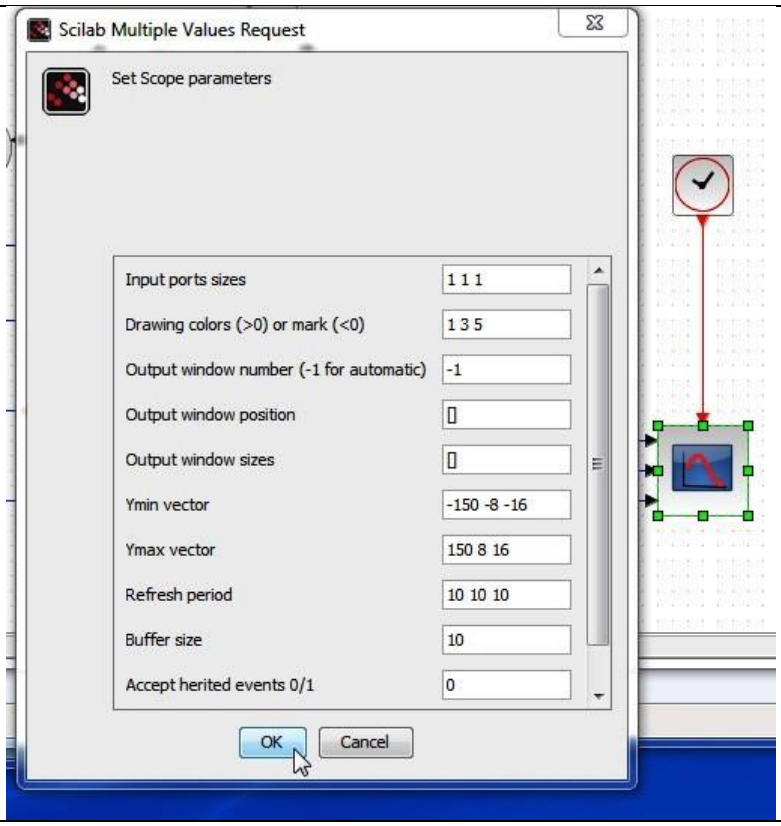
A sebesség kezdeti értékének megadádsa: 0.5 (rad/s)

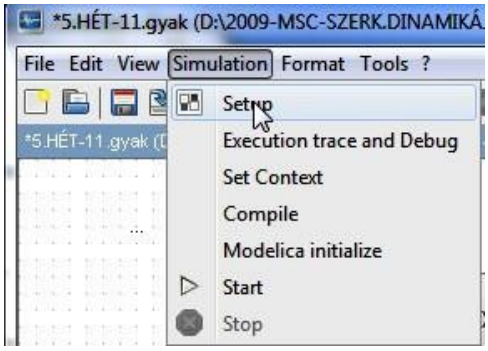




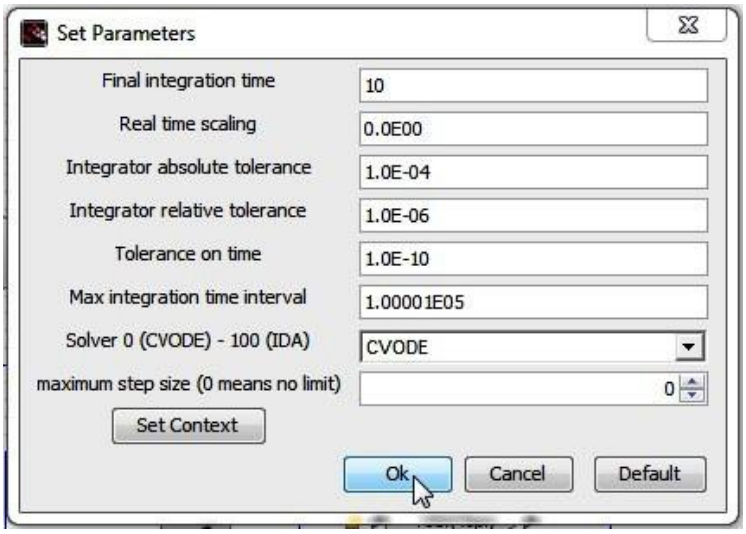
A kezdeti elmozdulás (szögelfordulás) megadása : 120 fok (de ezt át kell írni radiánba, és az átírt alakot kell megadni !!)

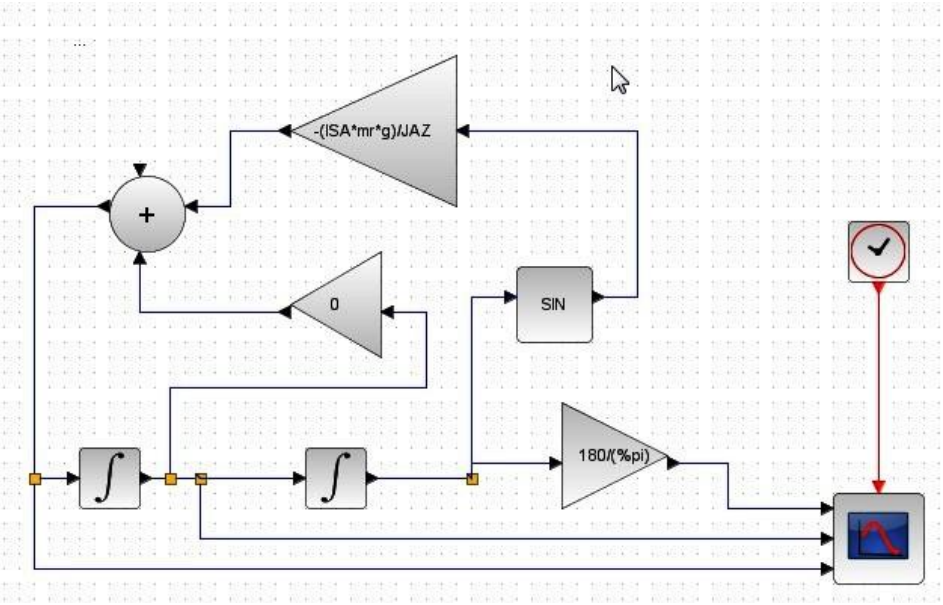
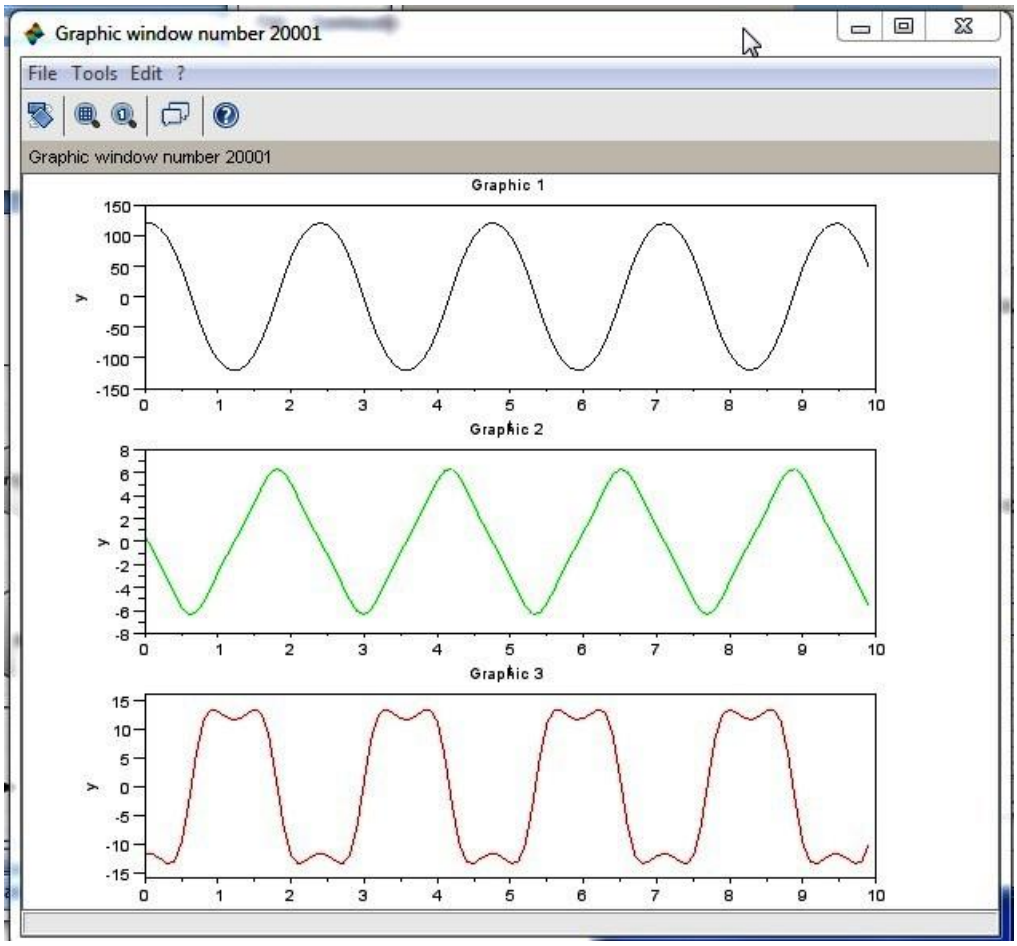






Az integrálás teljes hosszának beállítása: 10 (s)





Program futtatása: