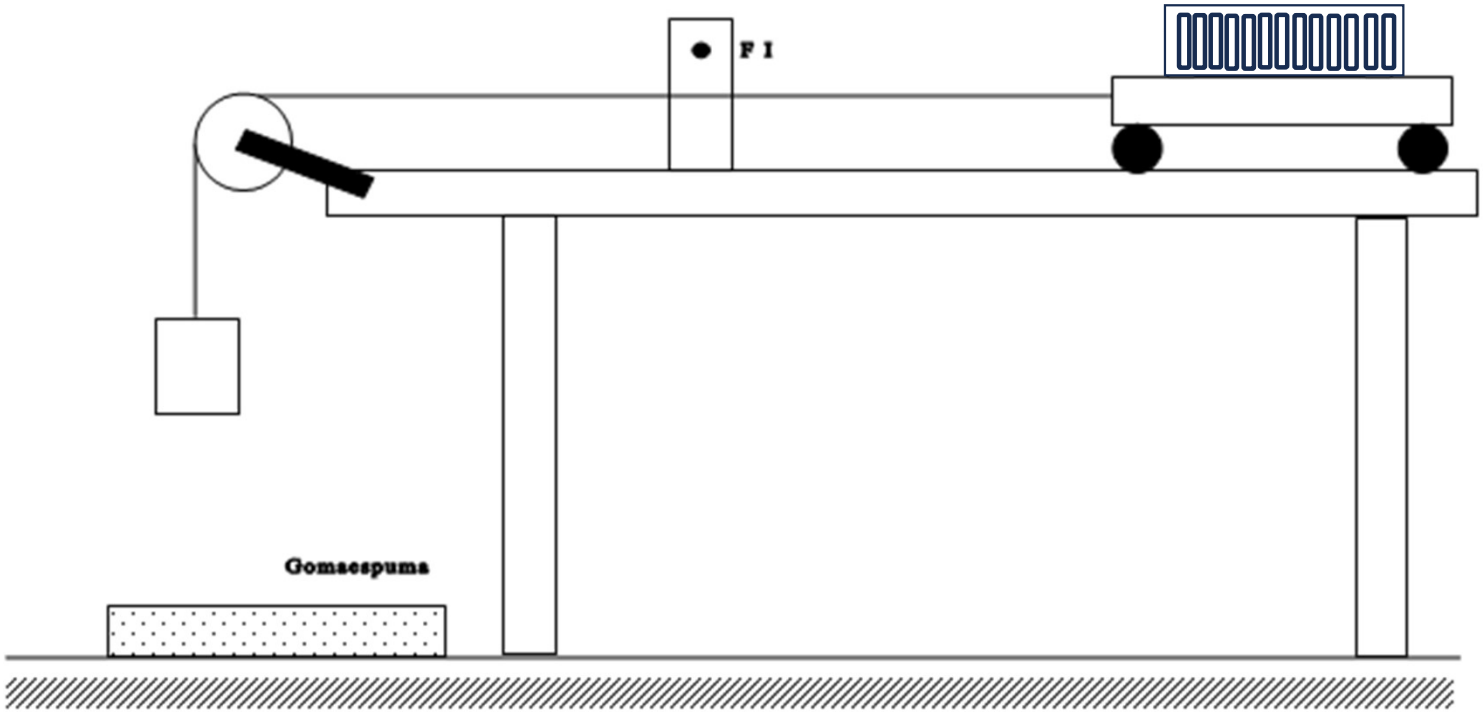
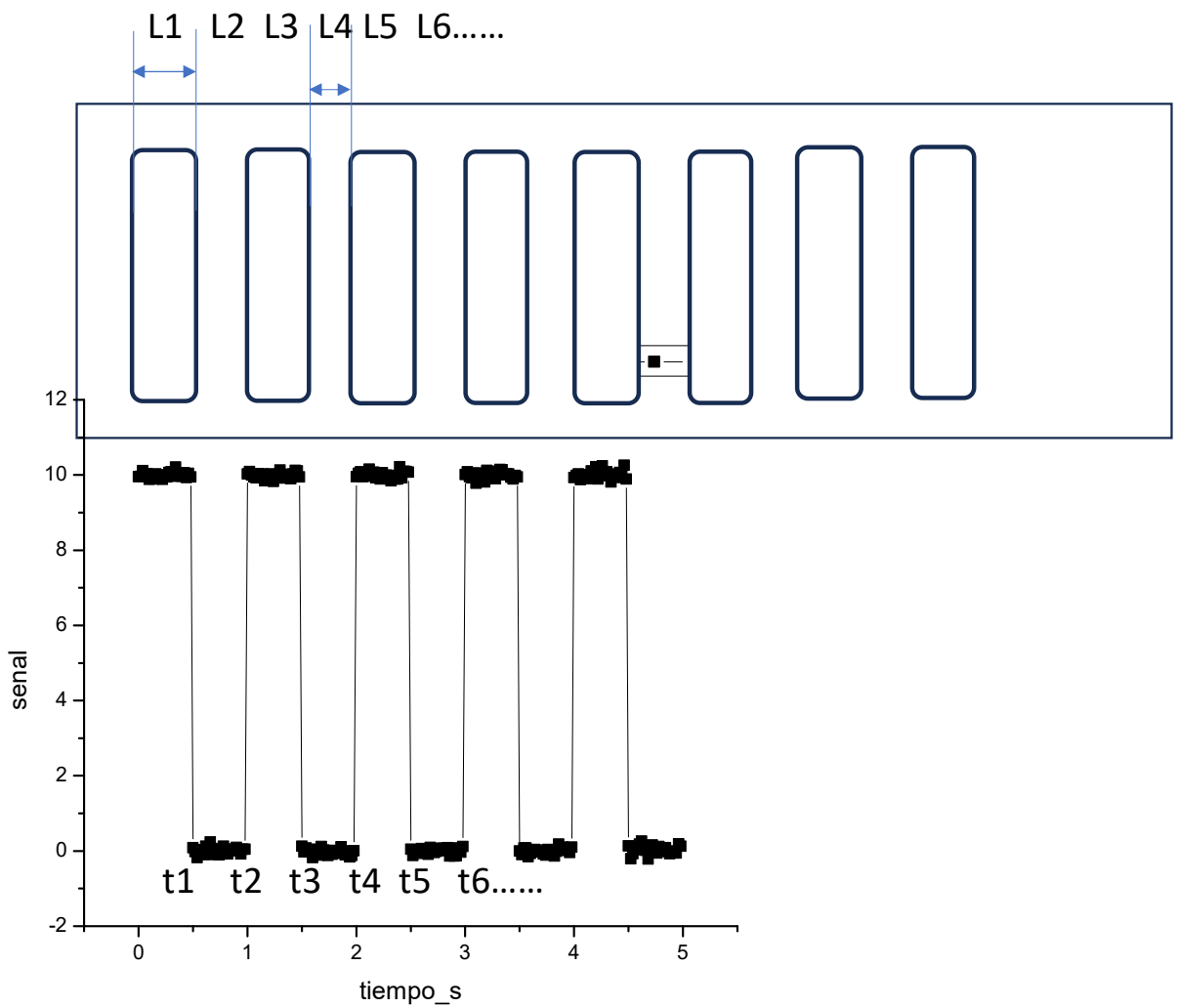
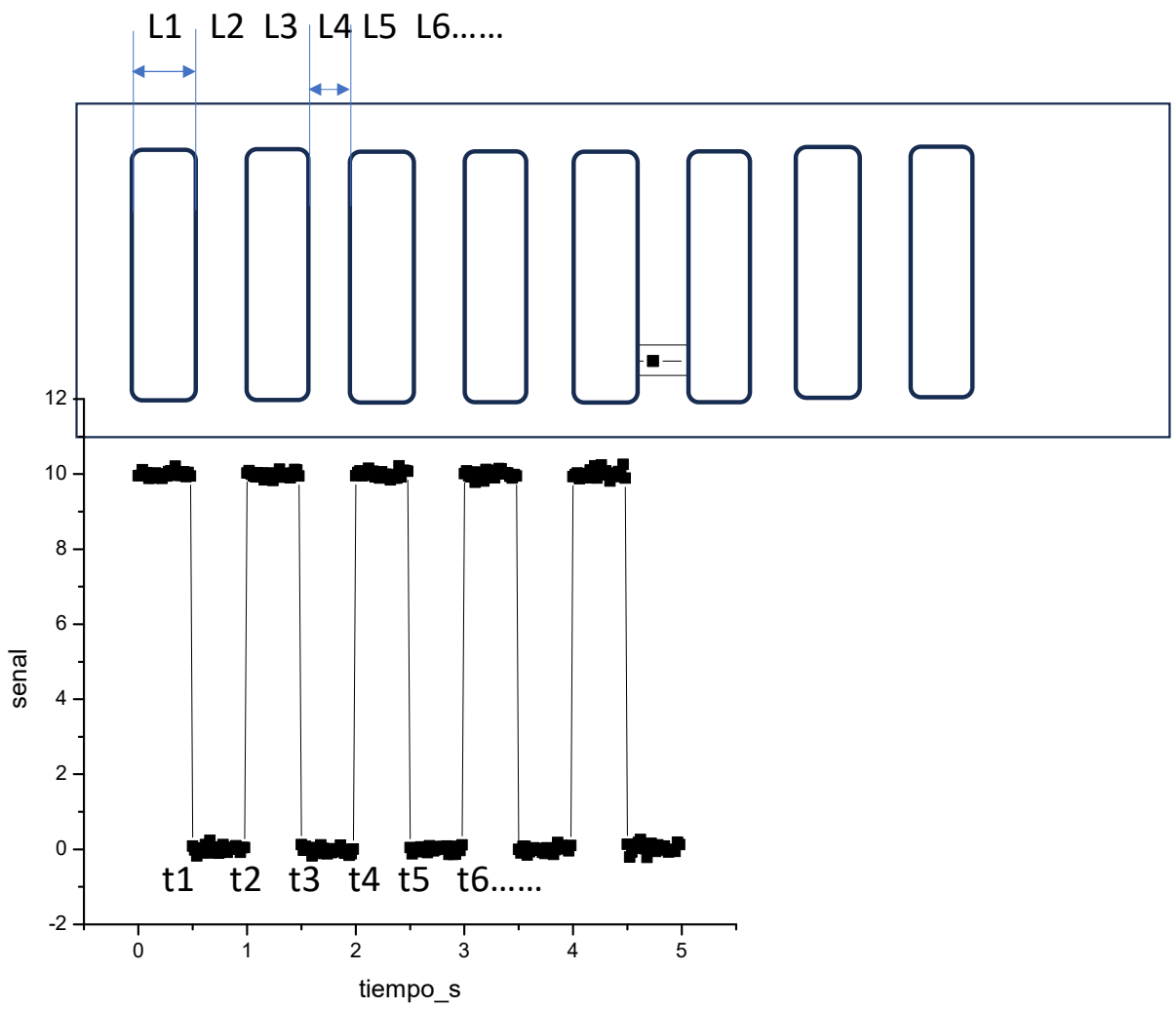
# Medición de velocidad y aceleración
## Descripción de movimientos




L1 L2 L3 L4 L5 L6……
12
10
8
6
4
2
0
-2
senal
t1 t2 t3 t4 t5 t6……
0
1
2
3
4
5
tiempo_s



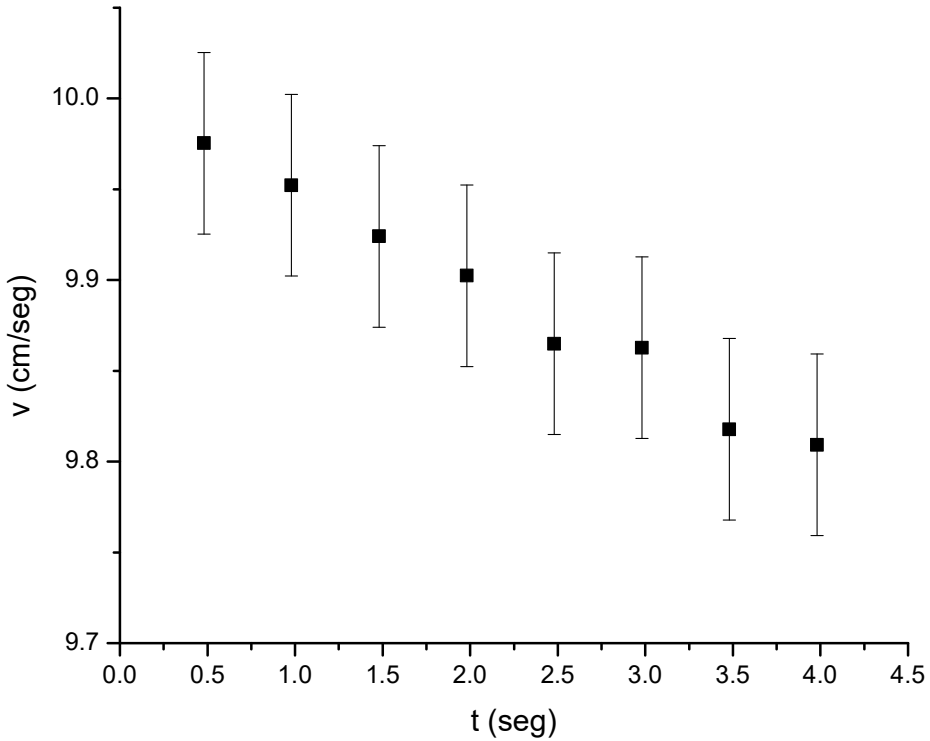

Con t1, t2, t3… y L1, L2, L3…

puedo obtener v1, v2, v3…

$$v_i = \frac{Li}{ti - ti}$$

t1, t2, t3… y L1, L2, L3…
Determinar incertezas

propagar en v1, v2, v3…




Obtener la aceleración

Analizar el movimiento (MRU, MRUV…)

OPTATIVO: analizar el origen de la aceleración (interacción gravitatoria, fuerza de rozamiento, etc).

OriginPro 8 - C:\Users\joaqu\Documents\Origin User Files\UNTITLED - /Folder1/

File Edit View Plot Column Worksheet Analysis Statistics Image Tools Format Window Help

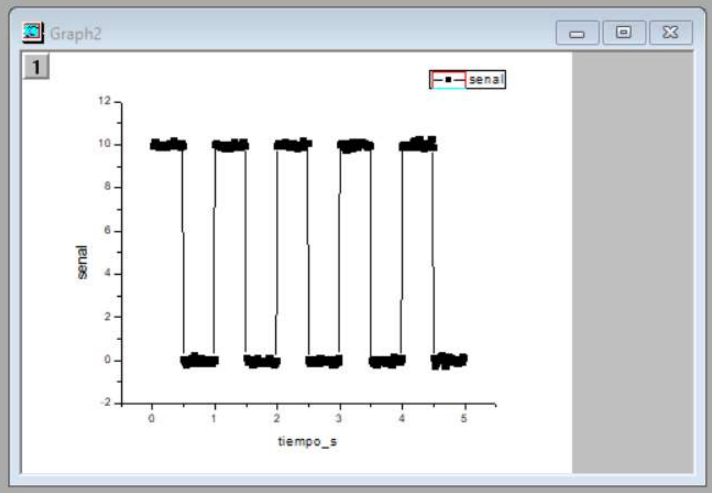
UNTITLED
Folder1

| Name | Dependents |
|---|---|
| Book1 | 1 |
| Graph1 | 0 |
| Graph2 | 0 |
| senal_cuadrada_ruid... | 1 |

Book2 - senal_cuadrada_ruidosa.csv

| | A(X) | B(Y) |
|---|---|---|
| Long Name | tiempo_s | senal |
| Units | | |
| Comments | | |
| Sparklines | | |
| 1 | ######## | 9.95817 |
| 2 | 0.0202 | 9.95865 |
| 3 | 0.03984 | 10.11107 |
| 4 | 0.05999 | 10.00469 |
| 5 | 0.08031 | 10.03212 |
| 6 | 0.10025 | 9.88186 |
| 7 | 0.11982 | 9.9235 |
| 8 | 0.14 | 9.8909 |
| 9 | 0.15982 | 10.02641 |
| 10 | 0.17994 | 9.92105 |

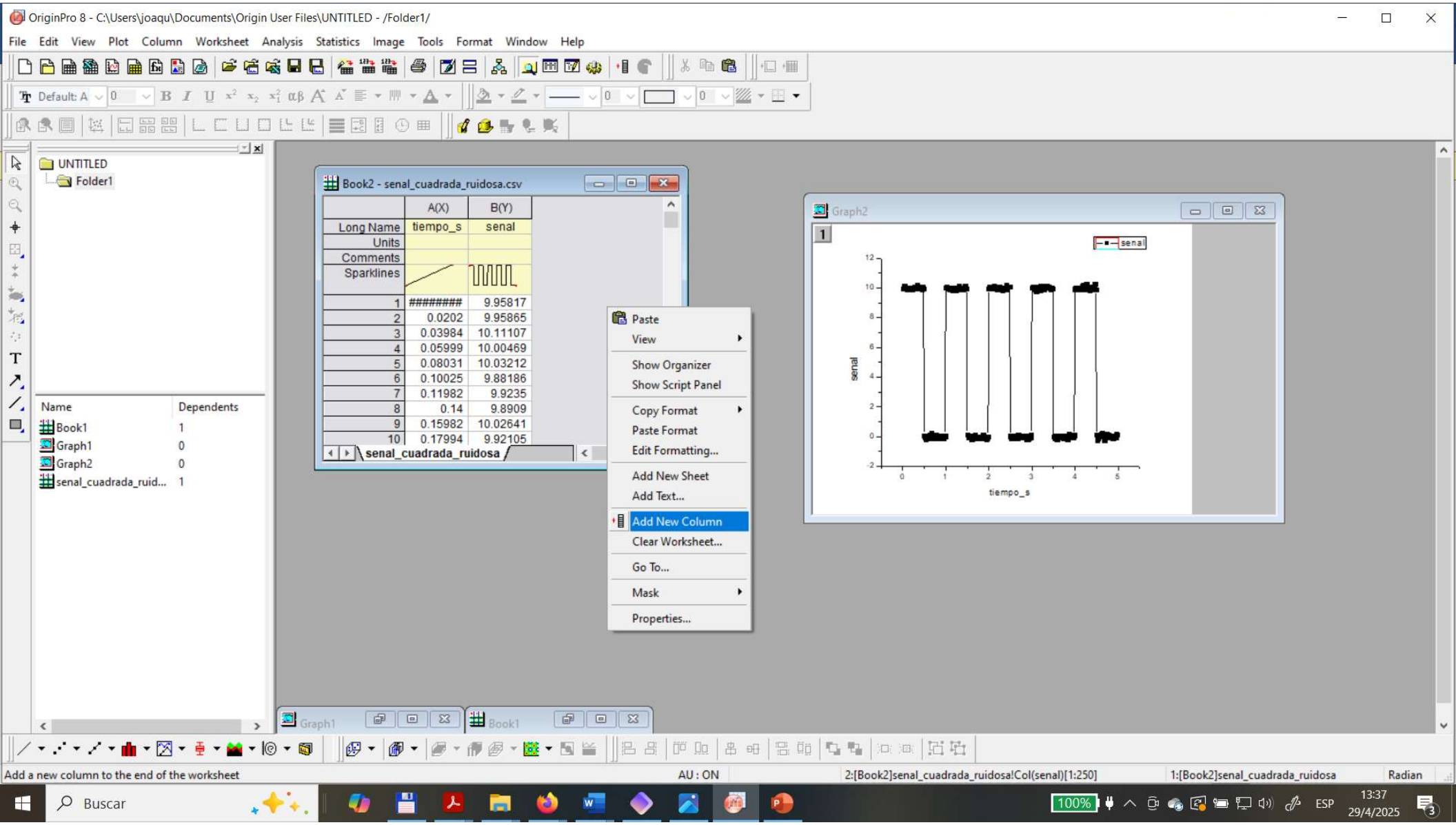
senal_cuadrada_ruidosa




Graph1 Book1

For Help, press F1 AU : ON 2:[Book2]senal_cuadrada_ruidosa!Col(senal)[1:250] 1:[Book2]senal_cuadrada_ruidosa Radian

Buscar 100% ESP 13:36 29/4/2025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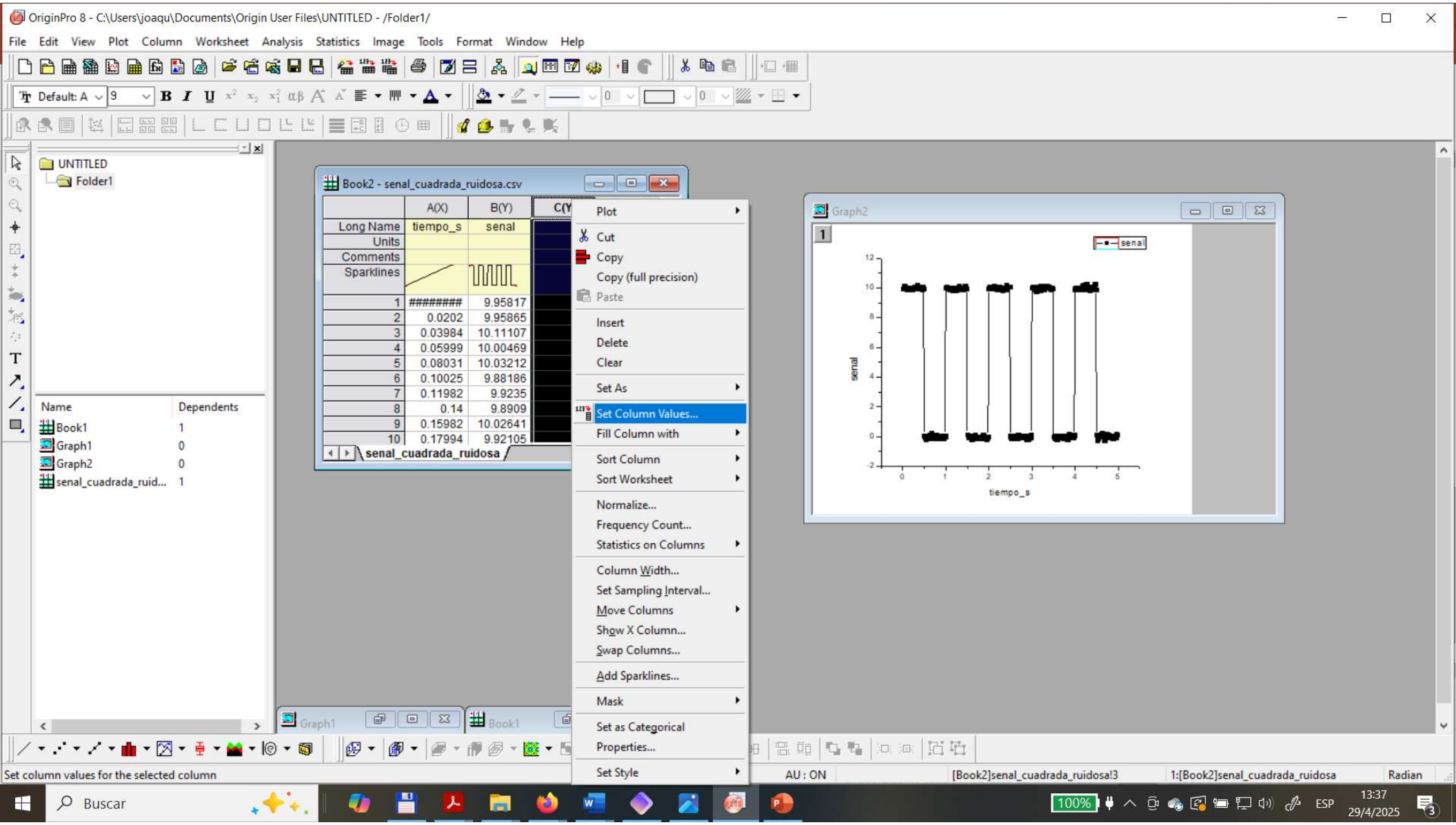
File Edit View Plot Column Worksheet Analysis Statistics Image Tools Format Window Help
UNTITLED
Folder1
Name Dependents
Book1 1
Graph1 0
Graph2 0
senal_cuadrada_ruid... 1
Book2 - senal_cuadrada_ruidosa.csv
A(X) B(Y)
Long Name tiempo_s senal
Units
Comments
Sparklines
1 ######## 9.95817
2 0.0202 9.95865
3 0.03984 10.11107
4 0.05999 10.00469
5 0.08031 10.03212
6 0.10025 9.88186
7 0.11982 9.9235
8 0.14 9.8909
9 0.15982 10.02641
10 0.17994 9.92105
senal_cuadrada_ruidosa
Paste
View
Show Organizer
Show Script Panel
Copy Format
Paste Format
Edit Formatting...
Add New Sheet
Add Text...
Add New Column
Clear Worksheet...
Go To...
Mask
Properties...
Graph2
senal
tiempo_s
Graph1
Book1
Add a new column to the end of the worksheet
AU : ON
2:[Book2]senal_cuadrada_ruidosa!Col(senal)[1:250]
1:[Book2]senal_cuadrada_ruidosa
Radian
Buscar
100%
ESP
13:37
29/4/2025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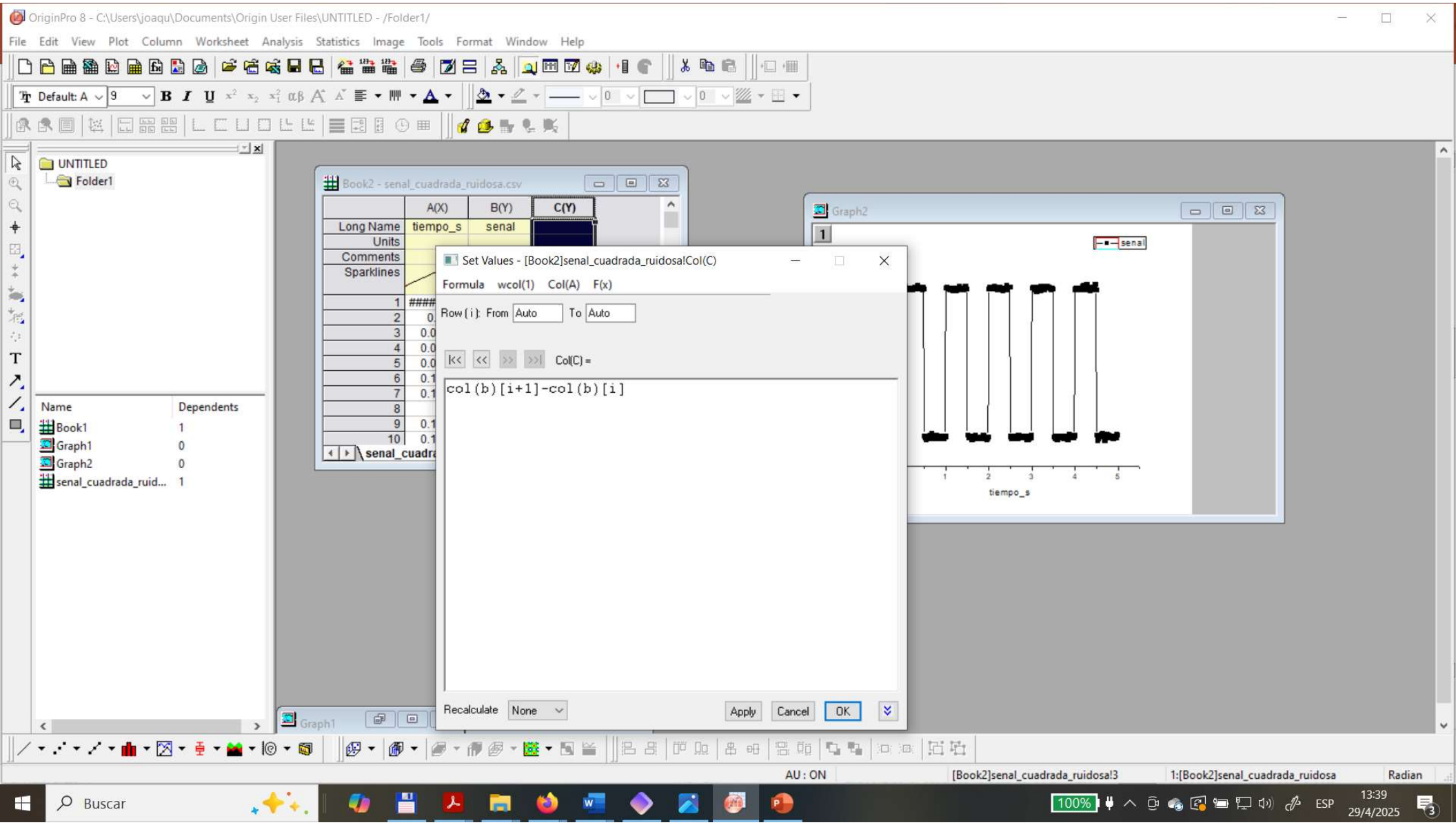
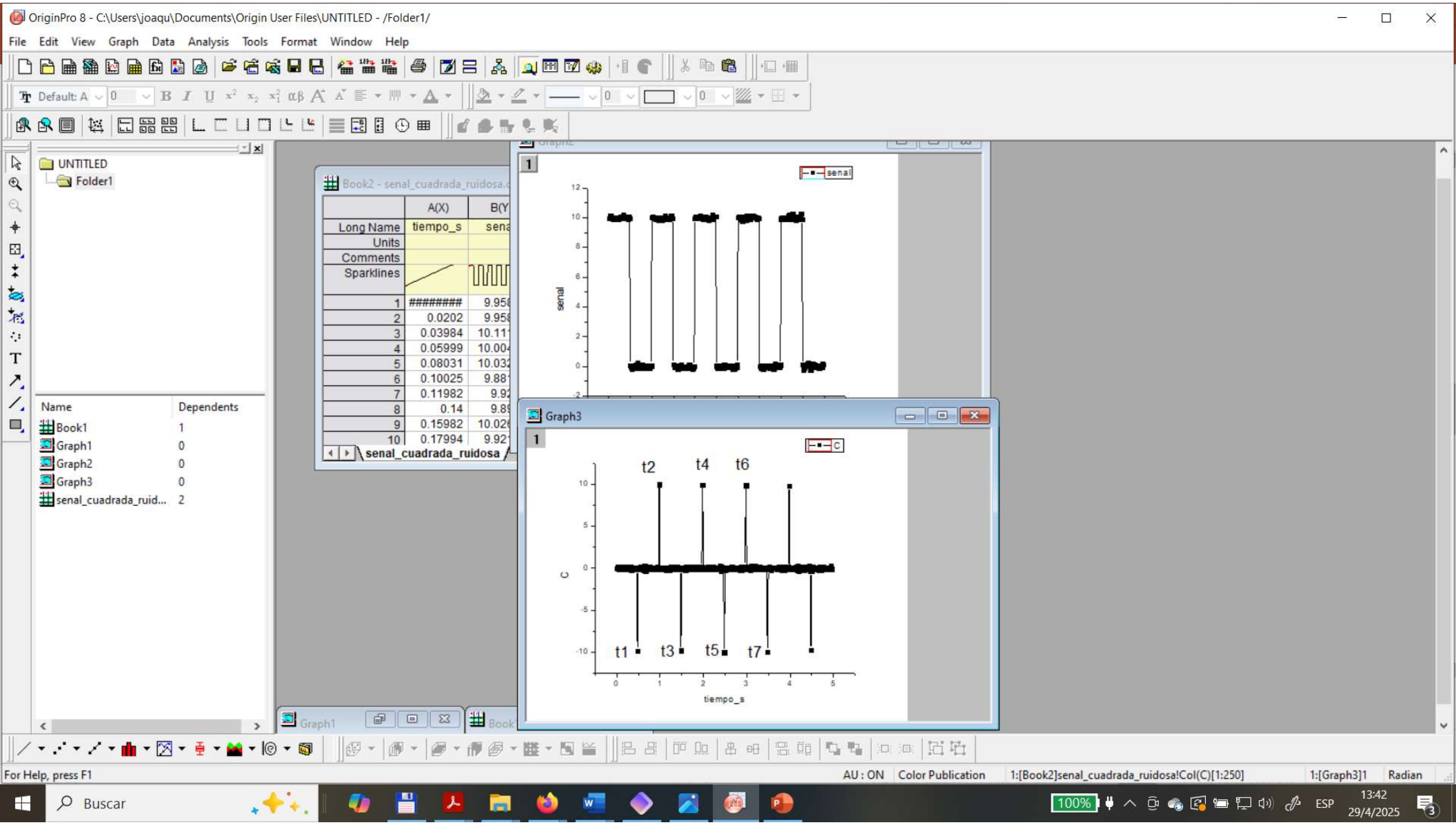
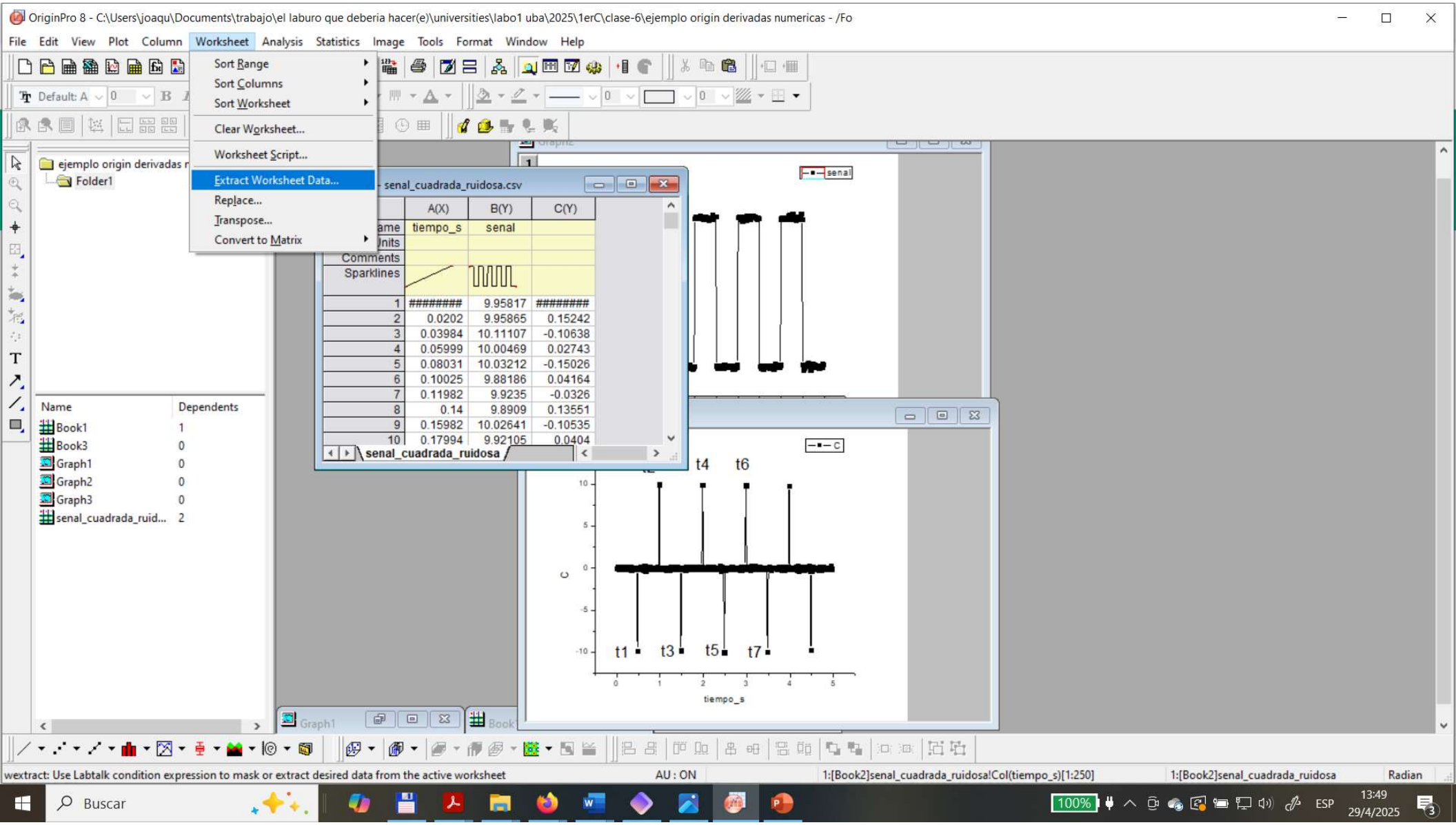
File Edit View Plot Column Worksheet Analysis Statistics Image Tools Format Window Help
UNTITLED
Folder1
Name Dependents
Book1 1
Graph1 0
Graph2 0
senal_cuadrada_ruid... 1
Book2 - senal_cuadrada_ruidosa.csv
A(X) B(Y)
Long Name tiempo_s senal
Units
Comments
Sparklines
1 ######## 9.95817
2 0.0202 9.95865
3 0.03984 10.11107
4 0.05999 10.00469
5 0.08031 10.03212
6 0.10025 9.88186
7 0.11982 9.9235
8 0.14 9.8909
9 0.15982 10.02641
10 0.17994 9.92105
senal_cuadrada_ruidosa
Plot
Cut
Copy
Copy (full precision)
Paste
Insert
Delete
Clear
Set As
Set Column Values...
Fill Column with
Sort Column
Sort Worksheet
Normalize...
Frequency Count...
Statistics on Columns
Column Width...
Set Sampling Interval...
Move Columns
Show X Column...
Swap Columns...
Add Sparklines...
Mask
Set as Categorical
Properties...
Set Style
Graph2
senal
tiempo_s
Graph1
Book1
Set column values for the selected column
AU : ON
[Book2]senal_cuadrada_ruidosa!3
1:[Book2]senal_cuadrada_ruidosa
Radian
Buscar
100%
ESP
13:37
29/4/2025


OriginPro 8 - C:\Users\joaqu\Documents\Origin User Files\UNTITLED - /Folder1/
File Edit View Plot Column Worksheet Analysis Statistics Image Tools Format Window Help
UNTITLED
Folder1
Name Dependents
Book1 1
Graph1 0
Graph2 0
senal_cuadrada_ruid... 1
Book2 - senal_cuadrada_ruidosa.csv
A(X) B(Y) C(Y)
Long Name tiempo_s senal
Units
Comments
Sparklines
Set Values - [Book2]senal_cuadrada_ruidosa!Col(C)
Formula wcol(1) Col(A) F(x)
Row ( i ): From Auto To Auto
Col(C) =
col(b)[i+1]-col(b)[i]
Recalculate None
Apply Cancel OK
Graph2
senal
tiempo_s
Graph1
AU : ON
[Book2]senal_cuadrada_ruidosa!3
1:[Book2]senal_cuadrada_ruidosa
Radian
Buscar
100%
ESP
13:39
29/4/2025


OriginPro 8 - C:\Users\joaqu\Documents\Origin User Files\UNTITLED - /Folder1/
File Edit View Graph Data Analysis Tools Format Window Help
UNTITLED
Folder1
Name Dependents
Book1 1
Graph1 0
Graph2 0
Graph3 0
senal_cuadrada_ruid... 2
Book2 - senal_cuadrada_ruidosa
A(X) B(Y
Long Name tiempo_s sena
Units
Comments
Sparklines
1 ######## 9.958
2 0.0202 9.956
3 0.03984 10.11
4 0.05999 10.004
5 0.08031 10.032
6 0.10025 9.881
7 0.11982 9.92
8 0.14 9.89
9 0.15982 10.026
10 0.17994 9.92
senal_cuadrada_ruidosa
senal
Graph3
C
t1 t2 t3 t4 t5 t6 t7
tiempo_s
Graph1
For Help, press F1
AU : ON
Color Publication
1:[Book2]senal_cuadrada_ruidosa!Col(C)[1:250]
1:[Graph3]1
Radian
Buscar
100%
ESP
13:42
29/4/2025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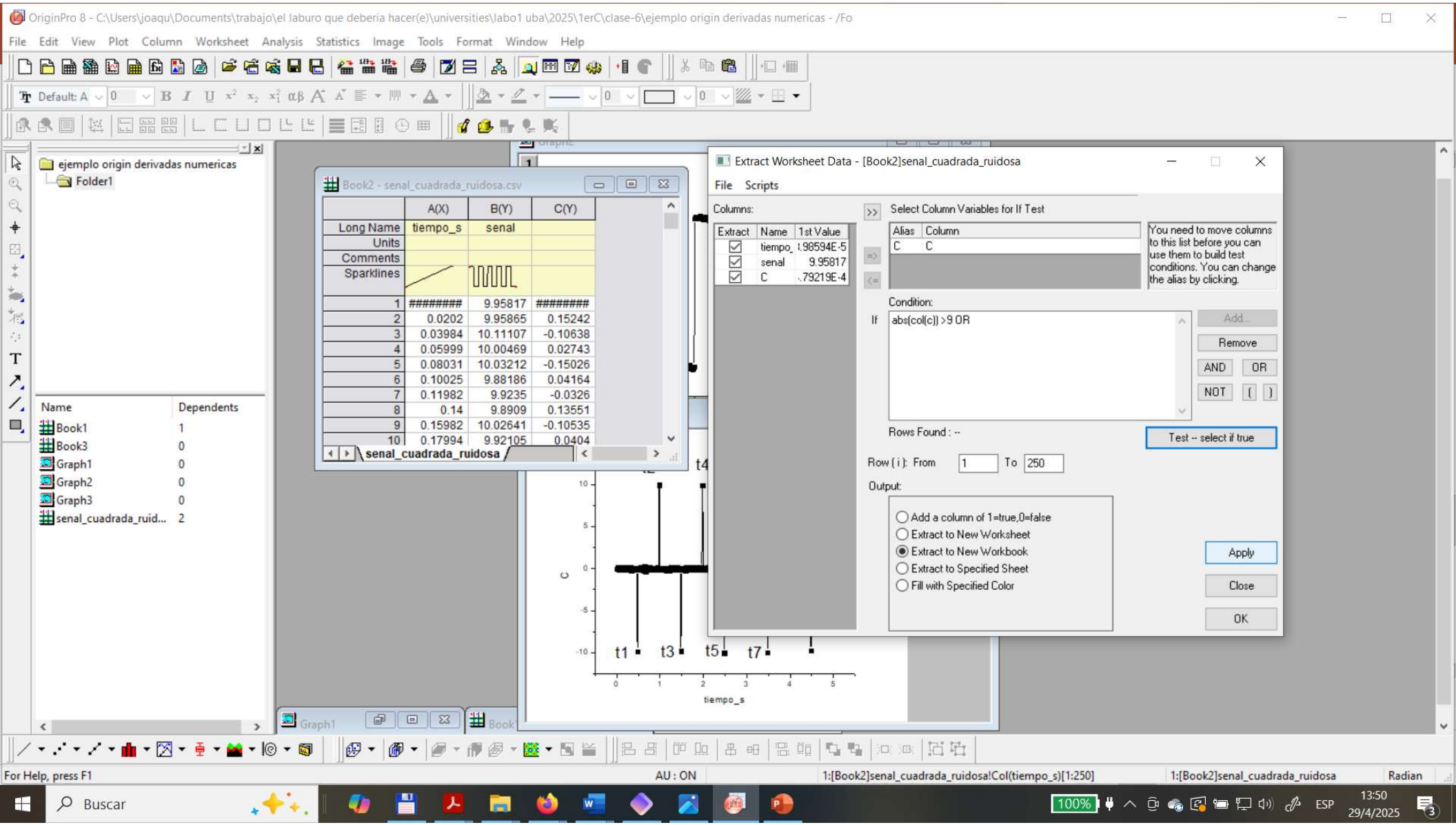
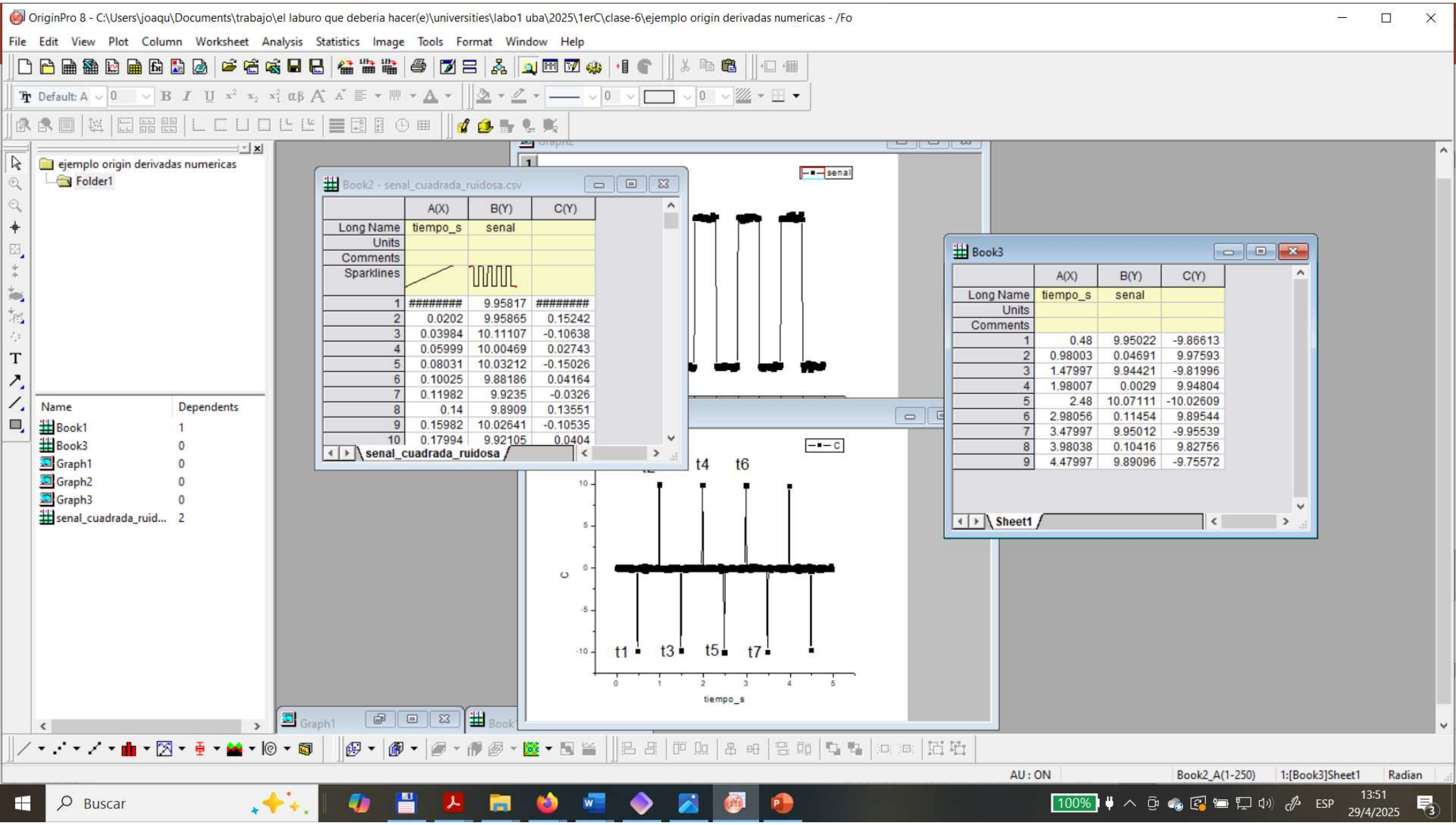
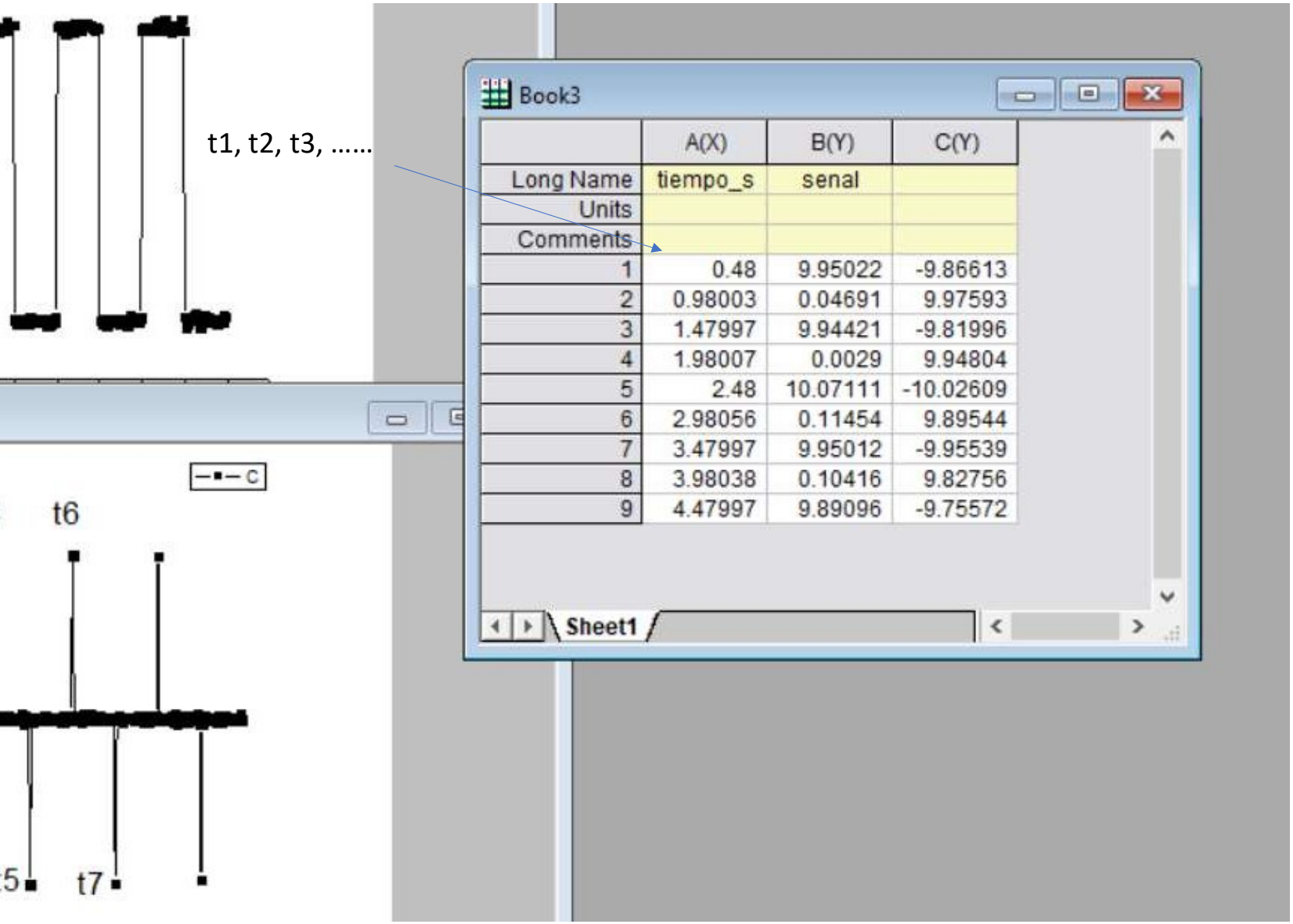
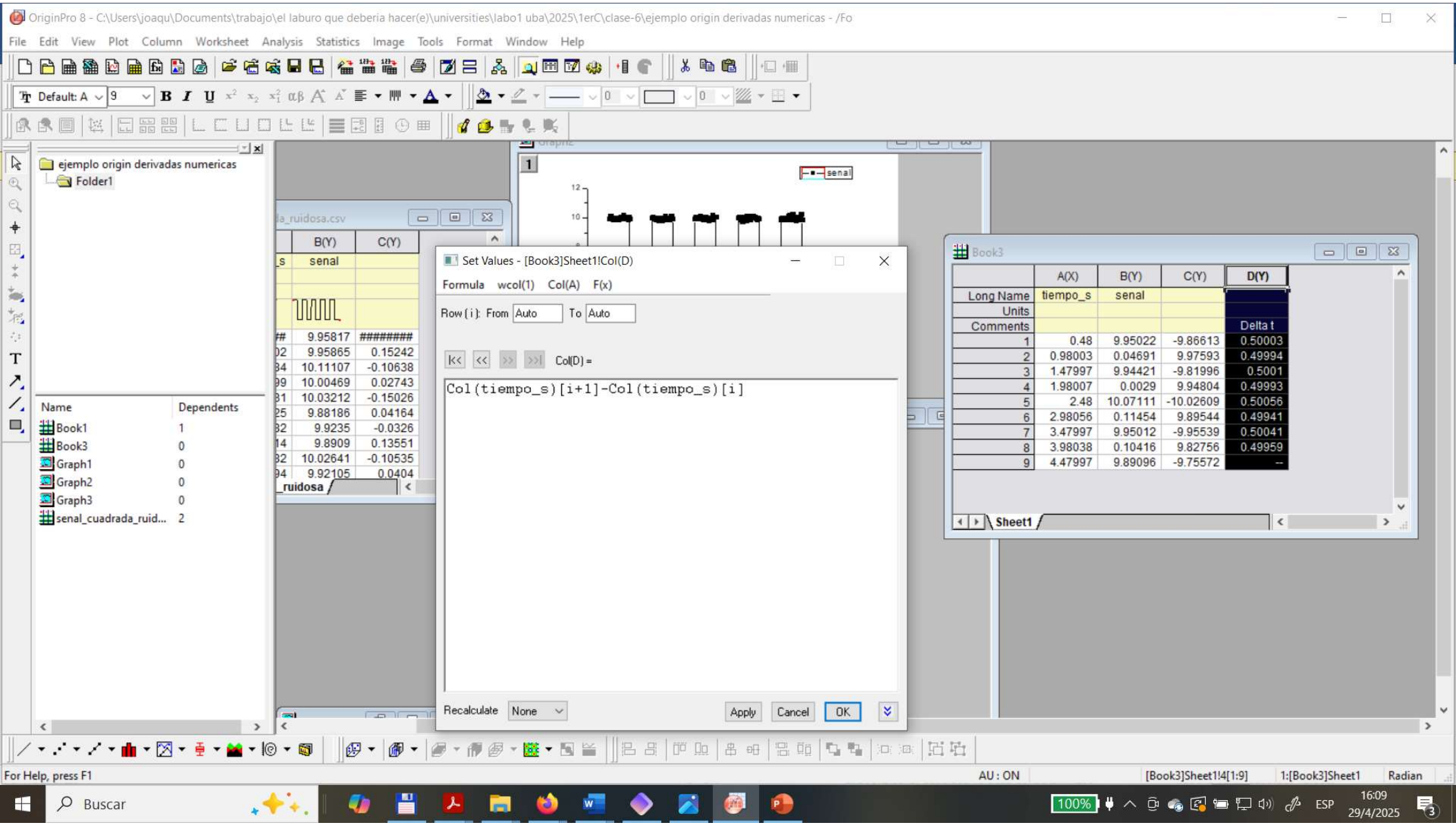
File Edit View Plot Column Worksheet Analysis Statistics Image Tools Format Window Help
Sort Range
Sort Columns
Sort Worksheet
Clear Worksheet...
Worksheet Script...
Extract Worksheet Data...
Replace...
Transpose...
Convert to Matrix
ejemplo origin derivadas r
Folder1
senal_cuadrada_ruidosa.csv
A(X) B(Y) C(Y)
tiempo_s senal
Comments
Sparklines
1 ######## 9.95817 ########
2 0.0202 9.95865 0.15242
3 0.03984 10.11107 -0.10638
4 0.05999 10.00469 0.02743
5 0.08031 10.03212 -0.15026
6 0.10025 9.88186 0.04164
7 0.11982 9.9235 -0.0326
8 0.14 9.8909 0.13551
9 0.15982 10.02641 -0.10535
10 0.17994 9.92105 0.0404
senal_cuadrada_ruidosa
senal
C
t1 t3 t5 t7 t4 t6
tiempo_s
Name Dependents
Book1 1
Book3 0
Graph1 0
Graph2 0
Graph3 0
senal_cuadrada_ruid... 2
wextract: Use Labtalk condition expression to mask or extract desired data from the active worksheet
AU : ON
1:[Book2]senal_cuadrada_ruidosa!Col(tiempo_s)[1:250]
1:[Book2]senal_cuadrada_ruidosa
Radian
Buscar
100%
ESP
13:49
29/4/2025


OriginPro 8 - C:\Users\joaqu\Documents\trabajo\el laburo que deberia hacer(e)\universities\labo1 uba\2025\1erC\clase-6\ejemplo origin derivadas numericas - /Fo
File Edit View Plot Column Worksheet Analysis Statistics Image Tools Format Window Help
ejemplo origin derivadas numericas
Folder1
Name Dependents
Book1 1
Book3 0
Graph1 0
Graph2 0
Graph3 0
senal_cuadrada_ruid... 2
Book2 - senal_cuadrada_ruidosa.csv
A(X) B(Y) C(Y)
Long Name tiempo_s senal
Units
Comments
Sparklines
1 ######## 9.95817 ########
2 0.0202 9.95865 0.15242
3 0.03984 10.11107 -0.10638
4 0.05999 10.00469 0.02743
5 0.08031 10.03212 -0.15026
6 0.10025 9.88186 0.04164
7 0.11982 9.9235 -0.0326
8 0.14 9.8909 0.13551
9 0.15982 10.02641 -0.10535
10 0.17994 9.92105 0.0404
senal_cuadrada_ruidosa
Extract Worksheet Data - [Book2]senal_cuadrada_ruidosa
File Scripts
Columns:
Extract Name 1st Value
tiempo_ 1.98594E-5
senal 9.95817
C -.79219E-4
Select Column Variables for If Test
Alias Column
C C
You need to move columns to this list before you can use them to build test conditions. You can change the alias by clicking.
Condition:
If abs(col(c)) >9 OR
Add...
Remove
AND OR
NOT ( )
Rows Found : --
Test -- select if true
Row ( i ): From 1 To 250
Output:
Add a column of 1=true,0=false
Extract to New Worksheet
Extract to New Workbook
Extract to Specified Sheet
Fill with Specified Color
Apply
Close
OK
t1 t3 t5 t7
tiempo_s
C
For Help, press F1
AU : ON
1:[Book2]senal_cuadrada_ruidosa!Col(tiempo_s)[1:250]
1:[Book2]senal_cuadrada_ruidosa
Radian
Buscar
100%
ESP
13:50
29/4/2025


OriginPro 8 - C:\Users\joaqu\Documents\trabajo\el laburo que deberia hacer(e)\universities\labo1 uba\2025\1erC\clase-6\ejemplo origin derivadas numericas - /Fo
File Edit View Plot Column Worksheet Analysis Statistics Image Tools Format Window Help
ejemplo origin derivadas numericas
Folder1
Name Dependents
Book1 1
Book3 0
Graph1 0
Graph2 0
Graph3 0
senal_cuadrada_ruid... 2
Book2 - senal_cuadrada_ruidosa.csv
A(X) B(Y) C(Y)
Long Name tiempo_s senal
Units
Comments
Sparklines
1 ######## 9.95817 ########
2 0.0202 9.95865 0.15242
3 0.03984 10.11107 -0.10638
4 0.05999 10.00469 0.02743
5 0.08031 10.03212 -0.15026
6 0.10025 9.88186 0.04164
7 0.11982 9.9235 -0.0326
8 0.14 9.8909 0.13551
9 0.15982 10.02641 -0.10535
10 0.17994 9.92105 0.0404
senal_cuadrada_ruidosa
senal
C
t1 t3 t5 t7 t4 t6
tiempo_s
Book3
A(X) B(Y) C(Y)
Long Name tiempo_s senal
Units
Comments
1 0.48 9.95022 -9.86613
2 0.98003 0.04691 9.97593
3 1.47997 9.94421 -9.81996
4 1.98007 0.0029 9.94804
5 2.48 10.07111 -10.02609
6 2.98056 0.11454 9.89544
7 3.47997 9.95012 -9.95539
8 3.98038 0.10416 9.82756
9 4.47997 9.89096 -9.75572
Sheet1
Graph1
AU : ON
Book2_A(1-250)
1:[Book3]Sheet1
Radian
Buscar
100%
ESP
13:51
29/4/2025


t1, t2, t3, ……
Book3
A(X)
B(Y)
C(Y)
Long Name
tiempo_s
senal
Units
Comments
1 0.48 9.95022 -9.86613
2 0.98003 0.04691 9.97593
3 1.47997 9.94421 -9.81996
4 1.98007 0.0029 9.94804
5 2.48 10.07111 -10.02609
6 2.98056 0.11454 9.89544
7 3.47997 9.95012 -9.95539
8 3.98038 0.10416 9.82756
9 4.47997 9.89096 -9.75572
Sheet1
C
t6
t7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File Edit View Plot Column Worksheet Analysis Statistics Image Tools Format Window Help
ejemplo origin derivadas numericas
Folder1
Name Dependents
Book1 1
Book3 0
Graph1 0
Graph2 0
Graph3 0
senal_cuadrada_ruid... 2
senal
Set Values - [Book3]Sheet1!Col(D)
Formula wcol(1) Col(A) F(x)
Row ( i ): From Auto To Auto
Col(D) =
Col(tiempo_s)[i+1]-Col(tiempo_s)[i]
Recalculate None
Apply Cancel OK
Book3
A(X) B(Y) C(Y) D(Y)
Long Name tiempo_s senal
Units
Comments Delta t
1 0.48 9.95022 -9.86613 0.50003
2 0.98003 0.04691 9.97593 0.49994
3 1.47997 9.94421 -9.81996 0.5001
4 1.98007 0.0029 9.94804 0.49993
5 2.48 10.07111 -10.02609 0.50056
6 2.98056 0.11454 9.89544 0.49941
7 3.47997 9.95012 -9.95539 0.50041
8 3.98038 0.10416 9.82756 0.49959
9 4.47997 9.89096 -9.75572 --
Sheet1
For Help, press F1
AU : ON
[Book3]Sheet1!4[1:9]
1:[Book3]Sheet1
Radian
Buscar
100%
ESP
16:09
29/4/2025

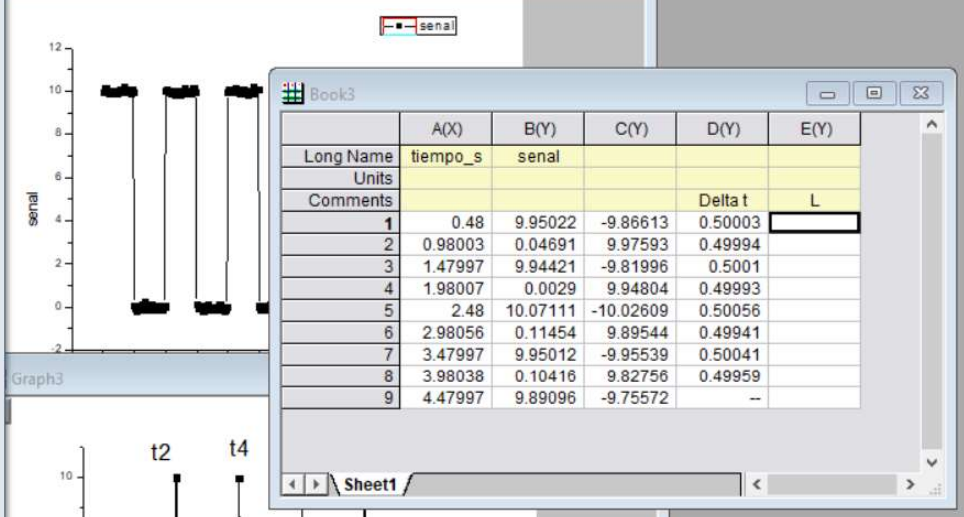
En este caso, tome todos los tiempos de modo que las distintas longitudes serán intervalos alternados:

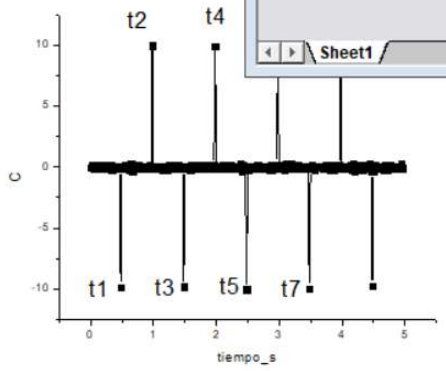
L1: obstuccion

L2: ventana

L3: obstruccion

…



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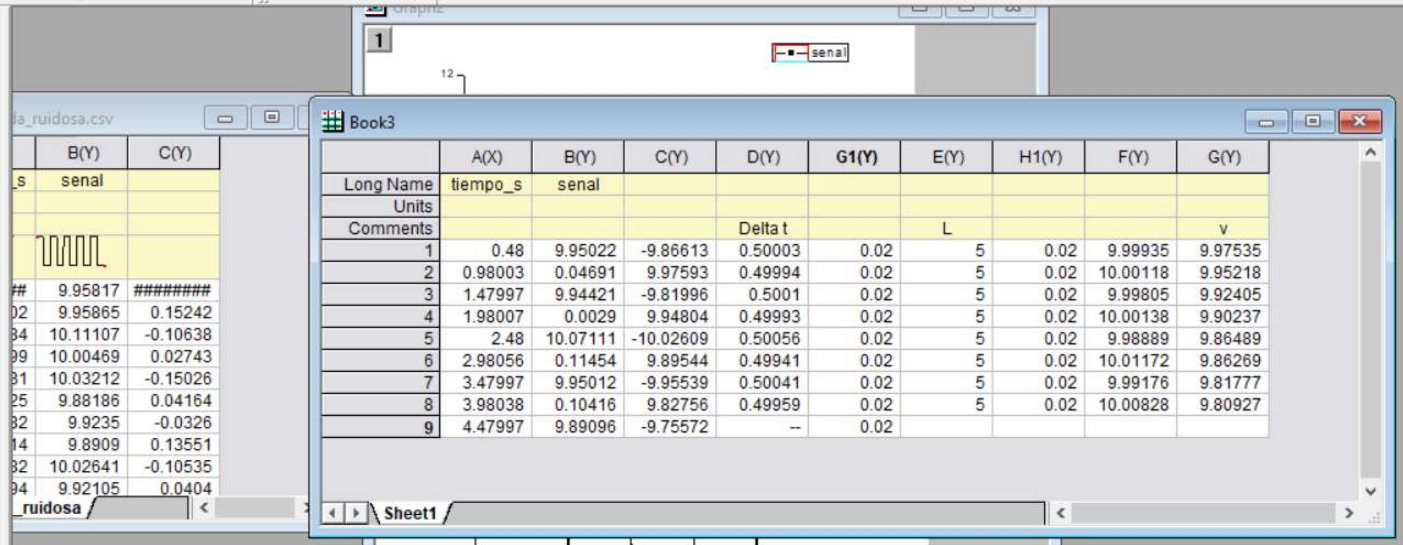
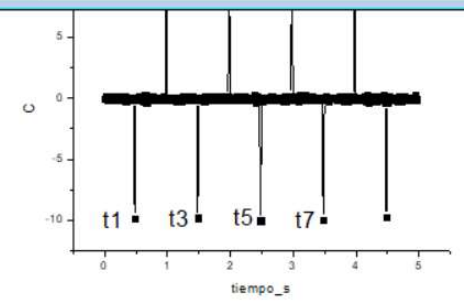
File Edit View Plot Column Worksheet Analysis Statistics Image Tools Format Window Help

ejemplo origin derivadas numericas
Folder1

| Name | Dependents |
|---|---|
| Book1 | 1 |
| Book3 | 1 |
| Graph1 | 0 |
| Graph2 | 0 |
| Graph3 | 0 |
| Graph4 | 0 |
| senal_cuadrada_ruid... | 2 |

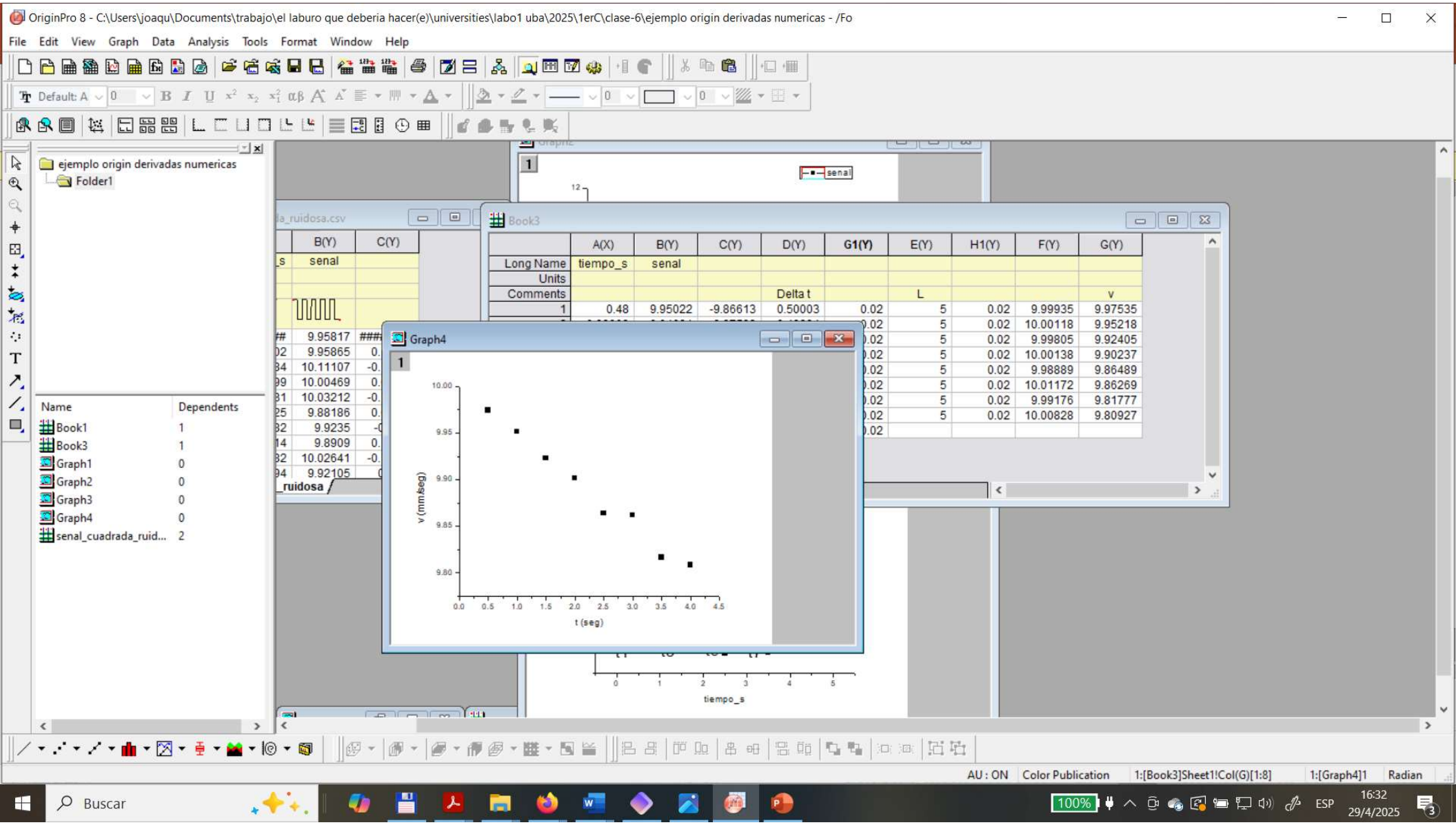



| | A(X) | B(Y) | C(Y) | D(Y) | G1(Y) | E(Y) | H1(Y) | F(Y) | G(Y) |
|---|---|---|---|---|---|---|---|---|---|
| Long Name | tiempo_s | senal | | | | | | | |
| Units | | | | | | | | | |
| Comments | | | | Delta t | | L | | | v |
| 1 | 0.48 | 9.95022 | -9.86613 | 0.50003 | 0.02 | 5 | 0.02 | 9.99935 | 9.97535 |
| 2 | 0.98003 | 0.04691 | 9.97593 | 0.49994 | 0.02 | 5 | 0.02 | 10.00118 | 9.95218 |
| 3 | 1.47997 | 9.94421 | -9.81996 | 0.5001 | 0.02 | 5 | 0.02 | 9.99805 | 9.92405 |
| 4 | 1.98007 | 0.0029 | 9.94804 | 0.49993 | 0.02 | 5 | 0.02 | 10.00138 | 9.90237 |
| 5 | 2.48 | 10.07111 | -10.02609 | 0.50056 | 0.02 | 5 | 0.02 | 9.98889 | 9.86489 |
| 6 | 2.98056 | 0.11454 | 9.89544 | 0.49941 | 0.02 | 5 | 0.02 | 10.01172 | 9.86269 |
| 7 | 3.47997 | 9.95012 | -9.95539 | 0.50041 | 0.02 | 5 | 0.02 | 9.99176 | 9.81777 |
| 8 | 3.98038 | 0.10416 | 9.82756 | 0.49959 | 0.02 | 5 | 0.02 | 10.00828 | 9.80927 |
| 9 | 4.47997 | 9.89096 | -9.75572 | -- | 0.02 | | | | |




0.02 AU : ON 1:[Book3]Sheet1 Radian

Buscar 100% ESP 16:32 29/4/2025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File Edit View Graph Data Analysis Tools Format Window Help
ejemplo origin derivadas numericas
Folder1
Name Dependents
Book1 1
Book3 1
Graph1 0
Graph2 0
Graph3 0
Graph4 0
senal_cuadrada_ruid... 2
Book3
Graph4
v (mm/seg)
t (seg)
tiempo_s
AU : ON Color Publication 1:[Book3]Sheet1!Col(G)[1:8] 1:[Graph4]1 Radian
Buscar
ESP
16:32
29/4/2025