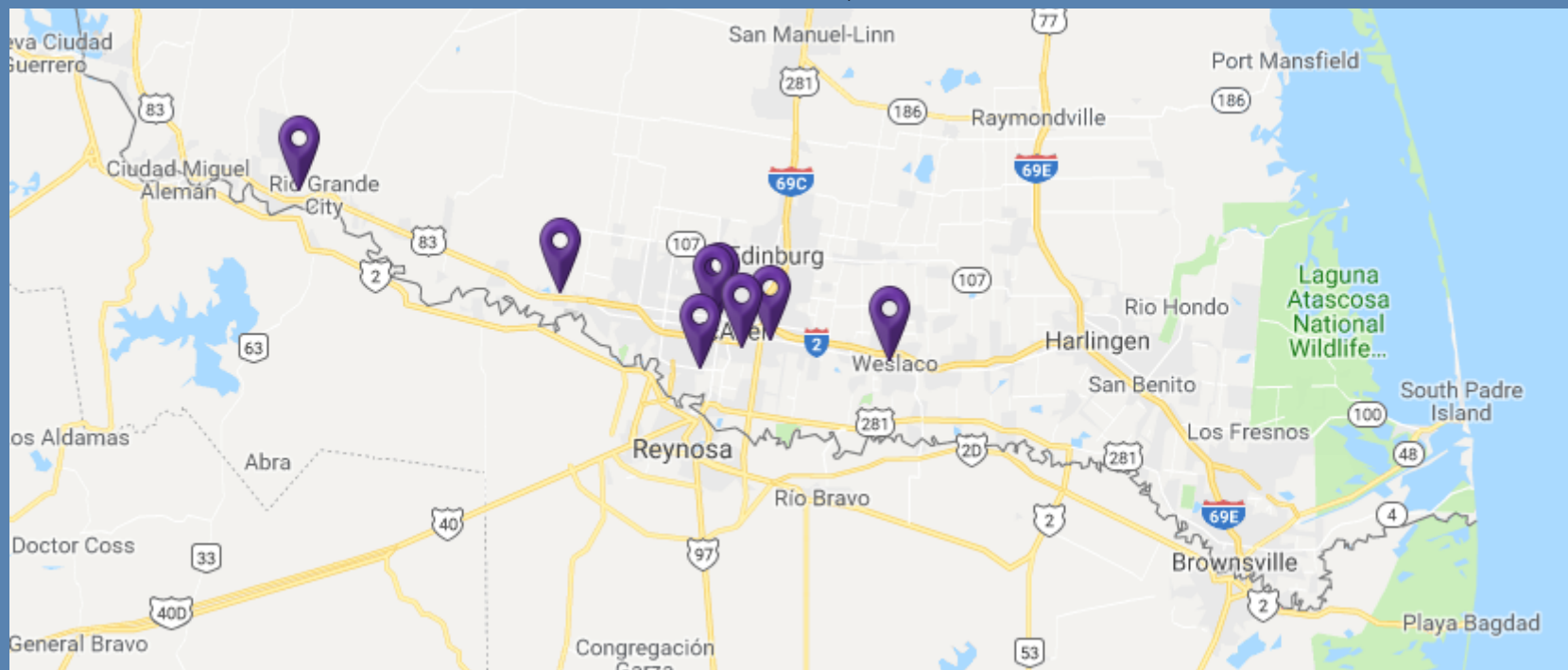


OER Software



- Eric J. Garcia
- Instructor of Mathematics
- South Texas College
- June 7, 2019



OBJECTIVES



- **Present a survey of OER softwares (OERS).**
- **Identify logistical advantages and disadvantages of using OERS.**
- **Identify pedagogical advantages and disadvantages of using OERS.**

Disclaimers



- I am not an expert.
- I am only speaking from my experiences.
- The views and opinions expressed in the presentation do not represent those of the host college, the presenter's college, nor TexMATYC or AMAYTC.

What is "Free"?



- The freedom to run the program as you wish, for any purpose (freedom 0).
- The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbor (freedom 2).
- The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

(R. Stallman, 2002)

This is "Free"



Free software is software that gives you the user the freedom to share, study and modify it. We call this free software because the user is free.

- FSF


The GNU OS



- <https://www.gnu.org>
- <https://www.fsf.org>

GeoGebra

The logo for GeoGebra, featuring the word "GeoGebra" in a sans-serif font. The letter "o" is replaced by a circular arrangement of six small blue dots connected by thin lines, forming a hexagon.

- 
- A thick black horizontal double-headed arrow pointing left and right, centered below the GeoGebra logo.
- “GeoGebra is dynamic mathematics software for all levels of education that brings together geometry, algebra, spreadsheets, graphing, statistics and calculus in one easy-to-use package.”
 - True open source
 - Runs online, as a download, or as a browser extension (online or offline.)
 - <https://dev.geogebra.org/trac/wiki/WikiStart>

GeoGebra

The logo for GeoGebra, featuring the word "GeoGebra" in a sans-serif font. The letter "o" is replaced by a geometric diagram consisting of a circle with five points on its circumference, connected by lines to form a pentagon. The points are colored in a gradient from light blue to purple.

- Virtual Manipulative
- Many studies on the effects of learning
- Secondary geometry students were assessed as either having high or low visualization ability (HV or LV)
- “LV students in GeoGebra group performed significantly better than control group
- (Saha, Ayub, Tarmizi, 2002)

GeoGebra



- **Examples**
- Derivative of sine
- Area construction

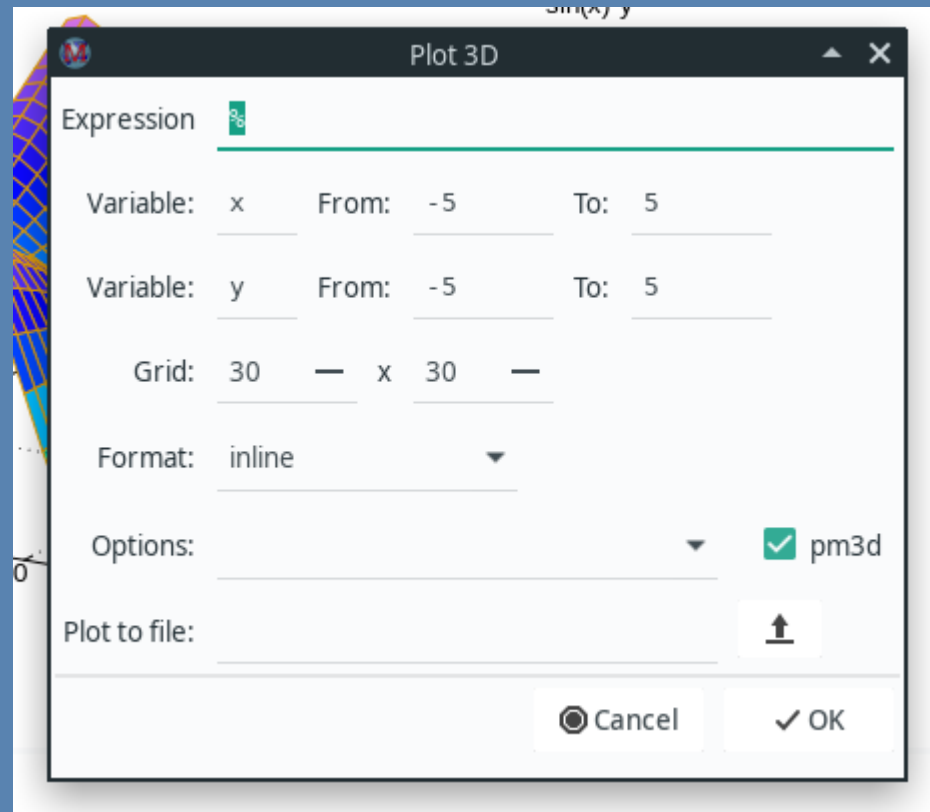
- (Hohenwater, Fuchs, 2004)



- [Maxima](#) is 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.”
- GUI is available ([wxMaxima](#))



- **3D Plot**

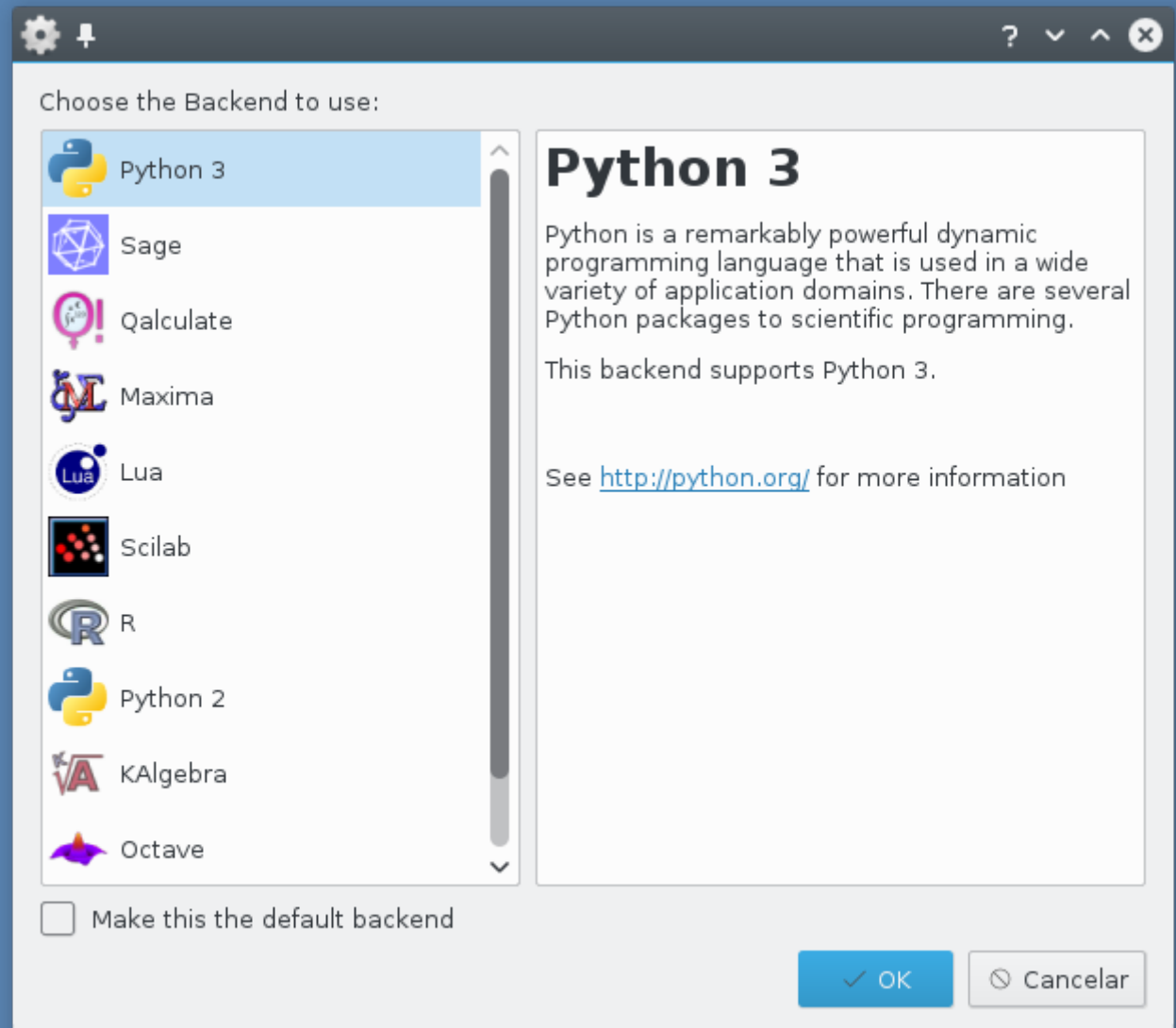




- The KDE® Community is a free software community dedicated to creating an open and user-friendly computing experience, offering an advanced graphical desktop, a wide variety of applications for communication, work, education and entertainment and a platform to easily build new applications upon. We have a strong focus on finding innovative solutions to old and new problems, creating a vibrant atmosphere open for experimentation.
- Cantor is an application that lets you use your favorite mathematical applications from within a nice KDE-integrated Worksheet Interface. It offers assistant dialogs for common tasks and allows you to share your worksheets with others.

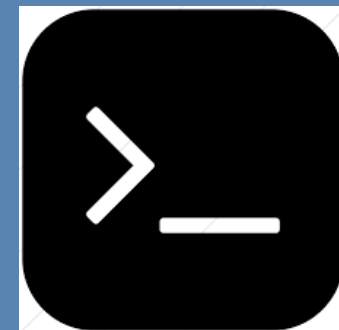


- Sage Math
- Qalculate
- KAlgebra
- Etc...





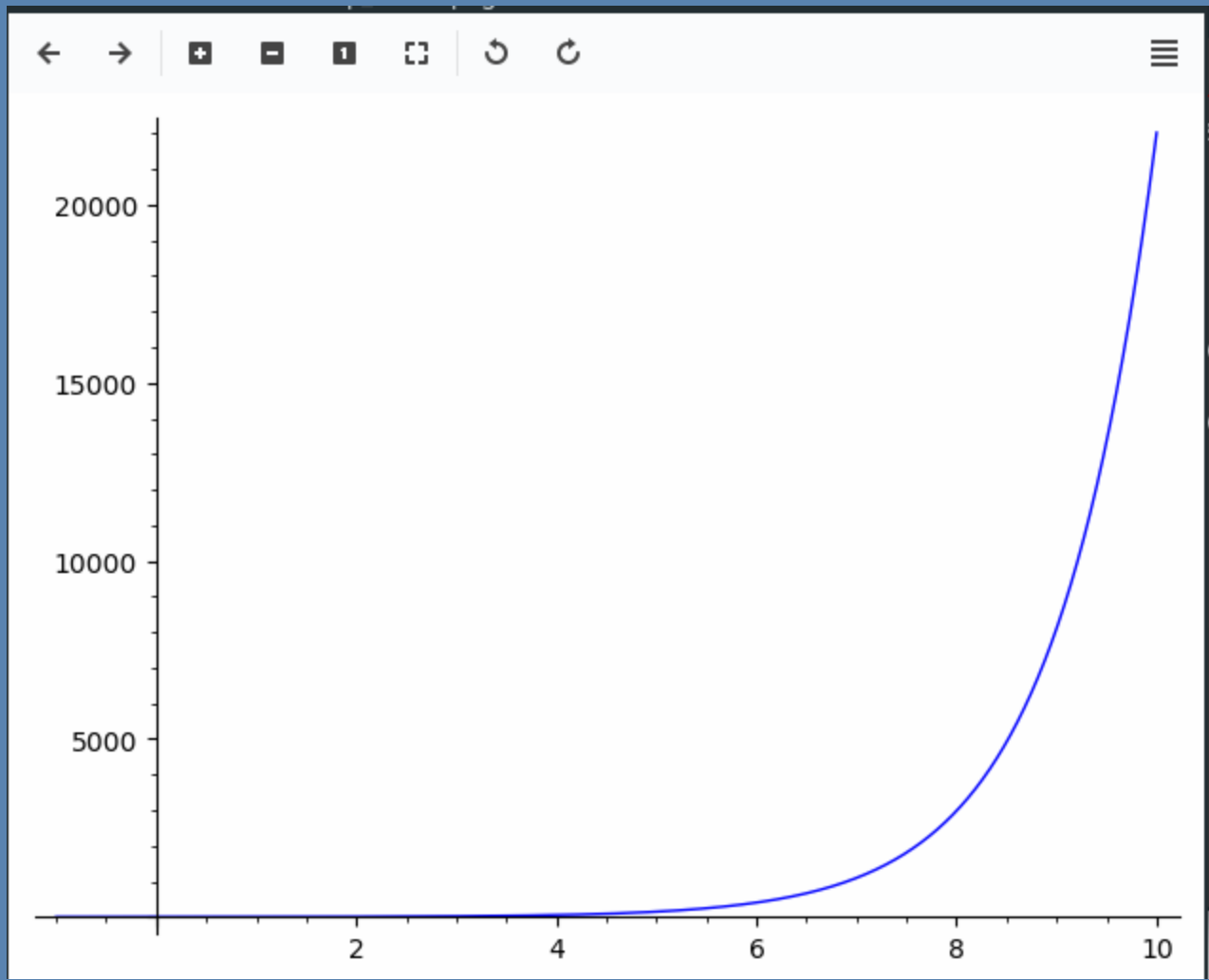
- SageMath is a free open-source mathematics software system licensed under the [GPL](#). It builds on top of many existing open-source packages: NumPy, SciPy, matplotlib, SymPy, Maxima, GAP, FLINT, R and many more.
- [Textbooks](#)
- Language is Python-based
- Server, Cloud, Cantor, Terminal





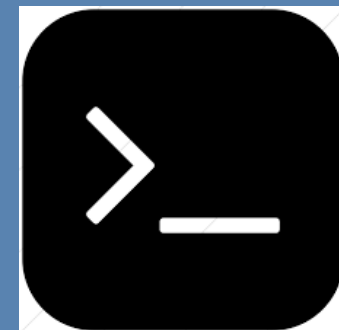
```
Terminal - IPython: home/dad
File Edit View Terminal Tabs Help
sage: plot2d(e^x, (x, -1, 10))
-----
NameError                                Traceback (most recent call last)
<ipython-input-4-1dc2599f9d83> in <module>()
----> 1 plot2d(e**x, (x, -Integer(1), Integer(10)))

NameError: name 'plot2d' is not defined
sage: plot(e^x, (x, -1, 10))
Launched png viewer for Graphics object consisting of 1 graphics primitive
sage: □
```



- GNU Octave is a high-level language, primarily intended for numerical computations. It provides a convenient command line interface for solving linear and nonlinear problems numerically, and for performing other numerical experiments using a language that is mostly compatible with Matlab.
- Most comparable to MatLab
- Terminal, or GUI



A screenshot of the GNU Octave software interface. The window title is "Octave". The menu bar includes "File", "Edit", "Debug", "Window", "Help", and "News". The "Current Directory" is set to "/home/dad". The interface is divided into several panels: a "File Browser" on the left showing a tree view of "/home/dad" with subfolders "Desktop", "Documents", and "Downloads"; a "Workspace" panel below it with a table header "Name", "Class", "Dimension", "Value", and "Attribute"; a "Command History" panel at the bottom left showing a list of commands and their outputs; and a "Command Window" on the right displaying the GNU Octave version 5.1.0 splash screen, including copyright information and configuration details. The Command Window text includes: "GNU Octave, version 5.1.0", "Copyright (C) 2019 John W. Eaton and others.", "This is free software; see the source code for copying conditions.", "There is ABSOLUTELY NO WARRANTY; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. For details, type 'warranty'.", "Octave was configured for \"x86_64-pc-linux-gnu\".", "Additional information about Octave is available at <https://www.octave.org>.", "Please contribute if you find this software useful.", "For more information, visit <https://www.octave.org/get-involved.html>", "Read <https://www.octave.org/bugs.html> to learn how to submit bug reports.", "For information about changes from previous versions, type 'news'.", and a prompt ">>". The bottom status bar shows the system tray with icons for network, volume, and time (02:03 AM).



```
For more information, visit https://www.octave.org/  
Read https://www.octave.org/bugs.html to learn how  
For information about changes from previous version  
  
>> A=[1,0,2;1,3,3;0,1,2]  
  
A =  
  
    1    0    2  
    1    3    3  
    0    1    2  
  
>> |
```

```
    0  1  2  
>> b=[3;7;3]  
  
b =  
  
    3  
    7  
    3  
  
>> |
```

```
>> x=A\b  
  
x =  
  
    1  
    1  
    1  
  
>> |
```

Command Window Documentation



- SymPy is a Python library for symbolic computation.
- Most like?
- Python, or [Web](#) as SymPyGamma.



- R is a language and environment for statistical computing and graphics. It is a GNU project which is similar to the S language and environment which was developed at Bell Laboratories (formerly AT&T, now Lucent Technologies) by John Chambers and colleagues. R can be considered as a different implementation of S. There are some important differences, but much code written for S runs unaltered under R.
- Terminal, or GUI (RStudio)



- R is well developed with 10,000 user-created packages
- Data mining
- In a study comparing two groups of students: traditional vs. Incorporating real-life data
- “in this course, we feel that we have learned something that we can use”
- “they had learned something which was not just 'for the exam'”
- (Libman, 2010)



- `x <- c(1,2,3,4,5,6,7)`
- `mean(x)`
- `sd(x)`
- `summary(x)`

- OR import data from a spreadsheet

A screenshot of the RStudio application window. The window title is 'RStudio'. The menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. The toolbar contains icons for file operations and navigation. The main interface is divided into several panes:

- Console:** Shows the R startup message: 'R is free software and comes with ABSOLUTELY NO WARRANTY. You are welcome to redistribute it under certain conditions. Type 'license()' or 'licence()' for distribution details. Natural language support but running in an English locale R is a collaborative project with many contributors. Type 'contributors()' for more information and 'citation()' on how to cite R or R packages in publications. Type 'demo()' for some demos, 'help()' for on-line help, or 'help.start()' for an HTML browser interface to help. Type 'q()' to quit R. [Workspace loaded from ~/.RData]'. Below this, the user has entered the command `> library(quantmod)`, which has loaded the 'xts' and 'zoo' packages. The console shows: 'Loading required package: xts', 'Loading required package: zoo', 'Attaching package: 'zoo'', 'The following objects are masked from 'package:base': as.Date, as.Date.numeric', 'Registered S3 method overwritten by 'xts': method from as.zoo.xts zoo', 'Loading required package: TTR', 'Registered S3 method overwritten by 'quantmod': method from as.zoo.data.frame zoo', 'Version 0.4-0 included new data defaults. See ?getSymbols.', and 'Learn from a quantmod author: https://www.datacamp.com/courses/importing-and-managing-financial-data-in-r'. The prompt `> |` is at the bottom.
- Environment:** Shows the 'Global Environment' with a search bar. Under the 'Data' section, there is a table with one row: 'AAPL' and a column of 'xts' objects: 'num [1:3127, 1:6] 12.3 12 12.3 12.3 12.3 ...'. There are icons for 'Import Dataset' and 'List'.
- Files, Plots, Packages, Help, Viewer:** These panes are currently empty.

A screenshot of the RStudio software interface. The window title is 'RStudio'. The menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. The toolbar shows icons for file operations and a search bar. The main console area displays the following text:

```
~/
type demo() for some demos, help() for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[Workspace loaded from ~/.RData]

> library(quantmod)
Loading required package: xts
Loading required package: zoo

Attaching package: 'zoo'

The following objects are masked from 'package:base':

  as.Date, as.Date.numeric

Registered S3 method overwritten by 'xts':
  method      from
as.zoo.xts zoo
Loading required package: TTR
Registered S3 method overwritten by 'quantmod':
  method      from
as.zoo.data.frame zoo
Version 0.4-0 included new data defaults. See ?getSymbols.
Learn from a quantmod author: https://www.datacamp.com/courses/importing-and-managing-fi
nancial-data-in-r
> getSymbols("AAPL",src="yahoo")
'getSymbols' currently uses auto.assign=TRUE by default, but will
use auto.assign=FALSE in 0.5-0. You will still be able to use
'loadSymbols' to automatically load data. getOption("getSymbols.env")
and getOption("getSymbols.auto.assign") will still be checked for
alternate defaults.

This message is shown once per session and may be disabled by setting
options("getSymbols.warning4.0"=FALSE). See ?getSymbols for details.

[1] "AAPL"
>
```

The Environment pane on the right shows the Global Environment with a search bar and a table of data objects. The table has one row with 'AAPL' and a description: 'An 'xts' object on 2007-01-03/2019-06-06 containi...'. Below the Environment pane is a toolbar with icons for Files, Plots, Packages, Help, and Viewer.



RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins Project: (None)

Console Terminal Jobs

```
~/
help.start() for an HTML browser interface to help.
Type 'q()' to quit R.

[Workspace loaded from ~/.RData]

> library(quantmod)
Loading required package: xts
Loading required package: zoo

Attaching package: 'zoo'

The following objects are masked from 'package:base':

  as.Date, as.Date.numeric

Registered S3 method overwritten by 'xts':
  method      from
as.zoo.xts zoo
Loading required package: TTR
Registered S3 method overwritten by 'quantmod':
  method      from
as.zoo.data.frame zoo
Version 0.4-0 included new data defaults. See ?getSymbols.
Learn from a quantmod author: https://www.datacamp.com/courses/importing-and-managing-financial-data-in-r
> getSymbols("AAPL",src="yahoo")
'getSymbols' currently uses auto.assign=TRUE by default, but will
use auto.assign=FALSE in 0.5-0. You will still be able to use
'loadSymbols' to automatically load data. getOption("getSymbols.env")
and getOption("getSymbols.auto.assign") will still be checked for
alternate defaults.

This message is shown once per session and may be disabled by setting
options("getSymbols.warning4.0"=FALSE). See ?getSymbols for details.

[1] "AAPL"
> chartSeries(AAPL)
>
```

Environment History Connections

Global Environment

Data

AAPL	An 'xts' object on 2007-01-03/2019-06-06 containi...
------	--

Files Plots Packages Help Viewer

Zoom Export Publish

AAPL [2007-01-03/2019-06-06]

Last 185.220001

Volume (millions):

800
400
0

Jan 03 2007 Jan 02 2009 Jan 03 2011 Jan 02 2013 Jan 02 2015 Jan 03 2017 Jan 02 2019



- PSPP is a program for statistical analysis of sampled data. It is a free replacement for the proprietary program, SPSS.
- One goal of the PSPP project is compatibility with the SPSS language. It currently features:
 - High-quality output formatting.
 - An easy to use graphical user interface.
 - A command line interface to allow seasoned users to rapidly perform analysis.
 - A comprehensive selection of data preprocessing, analysis and visualisation commands.
 - Portability: PSPP can be built on a very wide range of platforms.



*[DataSet1] — PSPPIRE Data Editor

File Edit View Data Transform Analyze Graphs Utilities Windows Help

8:y 14.00

Case	x	y	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var	Var
1	1.00	2.00																							
2	2.00	2.00																							
3	4.00	3.00																							
4	6.00	4.00																							
5	7.00	7.00																							
6	6.00	8.00																							
7	9.00	8.00																							
8	12.00	14.00																							
9																									
10																									
11																									
12																									
13																									
14																									
15																									
16																									

Data View Variable View

*[Screenshot_2019-06-07...] oersoftwarepresentation... *[DataSet1] — PSPPIRE D... 674E-7CC1 - File Manager 02:21 AM



► REGRESSION

REGRESSION
 REGRESSION
 /VARIABLES= x
 /DEPENDENT= y
 /METHOD=ENTER
 /STATISTICS=COEFF R ANOVA.

Model Summary (y)

R	R Square	Adjusted R Square	Std. Error of the Estimate
.94	.88	.86	1.55

ANOVA (y)

	Sum of Squares	df	Mean Square	F	Sig.
Regression	103.54	1	103.54	42.96	.001
Residual	14.46	6	2.41		
Total	118.00	7			

Coefficients (y)

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.27	1.10	.00	-.25	.813
x	1.07	.16	.94	6.55	.001

References



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- Libman, Z. (2010). Integrating real-life data analysis in teaching descriptive statistics: A constructivist approach. *Journal of Statistics Education*, 18(1).
- Saha, R. A., Ayub, A. F. M., & Tarmizi, R. A. (2010). The effects of GeoGebra on mathematics achievement: enlightening coordinate geometry learning. *Procedia-Social and Behavioral Sciences*, 8, 686-693.
- Stallman, R. M. (2002). *Free Software, Free Society*.