

Numerical Solution of Differential Equations Using Free Software

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What is Free Software ?

Nontrivial question

What is Free Software ? (as per Wikipedia)

- [computer software](#) distributed under terms that allow users to run the software for any purpose as well as to study, change, and distribute it and any adapted versions
- a matter of [liberty](#), not price: all users are legally free to do what they want with their copies of a free software (including profiting from them) regardless of how much is paid to obtain the program

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- The **Free Software Foundation (FSF)** is a [501\(c\)\(3\) non-profit organization](#) founded by [Richard Stallman](#) on October 4, 1985 to support the [free software movement](#)
- GNU – Linux - free OS ; passionate advocates!

What is Free Software ?

“free as in speech”

FREE = Freedom. ←- Free Software Foundation

“free as in beer”

FREE = FREE of charge = freedom from having to pay money ← Me (mostly)

I’m an instructor of mathematics. I care about software I can use with my students...

Free Software: What Matters

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- 1) Usable
- 2) Quick Start
- 3) Freedom to Use Anywhere
- 4) Future Use

Modifying source code ???

Free Software for Math

- Wolfram Alpha
 - Ease of use
 - Trial and error
 - Highly Functional (cousin of Mathematica)
- R
 - **R** is a [programming language](#) and [free software](#) environment for [statistical computing](#) and graphics supported by the R Foundation for Statistical Computing

Free Software for Math

- Wolfram Alpha
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- R
 - R is a [programming language](#) and [free software](#) environment for [statistical computing](#) and graphics supported by the R Foundation for Statistical Computing.
 - Rising in popularity – data science – sports analytics
 - Highly efficient and easy to run
 - For students: introduction to logic
 - NOT point and click

Free* Software for Diff EQ – and Math

- Wolfram Alpha
- R
- Discussion : What else for K-12 and undergrad teaching?
 - I won't pretend to be the world's leading expert

Priorities in Teaching

- Why do we teach math ?
When in theory computers can do it all

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My Answers

- (1) Transferable skills
- (2) Certification
- (3) Other Reasons

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Bottom Line : For me as teacher : a black box that solves Diff EQ's is not the main goal

Remainder of This Talk

- Numerical Solution of Differential Equation in R
 $dx/dt = x(1-x)$ with $x(0) = 0.1$
- If time permits- some commands in Wolfram Alpha
- If time permits- discussion
- Now to share screen with R Studio