

Supplemental Material for
Exploring Interactive and Dynamics Simulations using a Computer Algebra System in an Advanced
Placement Chemistry Course

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The content in this supplemental materials section includes various technical and legal issues in using a CAS in a my high school chemistry classes and a series of screen shots to illustrate the use of the “show work” feature in Mathematica.

The current version of the Mathematica software (Mathematica 9) requires ¹ Intel Pentium IV 2.4 GHz or equivalent processor, 5.5 GB disk space, 2 GB RAM, and operating system: Windows XP or later, Mac OS X 10.6 or later, or Linux). Almost all of the proprietary and free versions of CAS software will run in either in Windows or Mac OS ².

For teachers interested in making their Mathematica (i.e. *.nb) files ³ or files converted into the cdf file ⁴ available online, may need to contact their website host to set the MINE type ⁵ accordingly.

Teachers planning to use Mathematica extensively should be aware of their potential lack of intellectual property rights. For example, in a journal article targeted to school administrators, an attorney specializing in school law wrote ⁶ :

“School districts every day create dozens, if not thousands, of pieces of intellectual property. . . . this district-owned property can generate a tidy source of revenue for the district. . . . You may have on-site technology staff members who write code . . . are valuable resources. . . . you have created a turnkey marketable product. ”.

In support of school districts having the intellectual property rights to a teacher’s work, in a National Education Association article, it states ⁷:

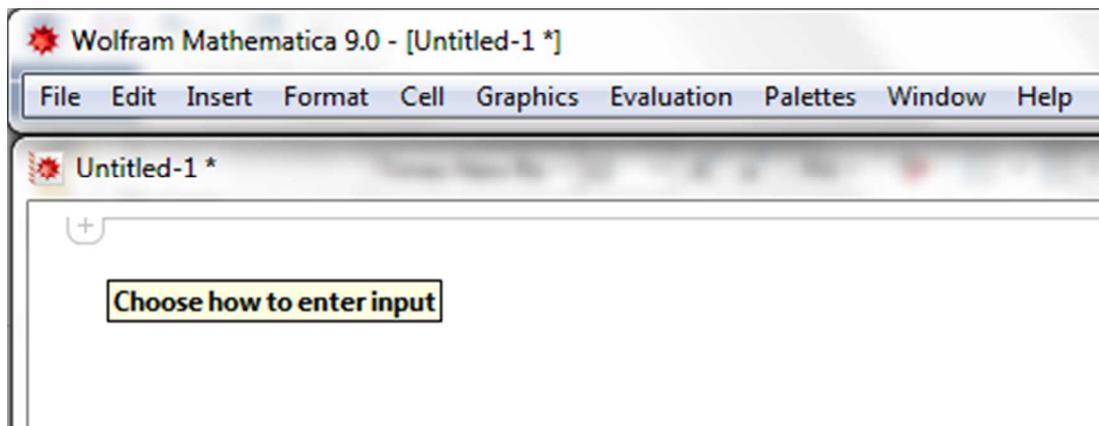
“In 2004, a federal appellate court in New York ruled that “tests, quizzes, homework problems, and other teaching materials” were works made for hire owned by the district. . . . And don’t think districts won’t swoop in and exercise their rights. . . . in upstate New York where a school district banned a teacher from selling her work.”

Lastly, in an article by the California Teacher’s Association, it states⁸:

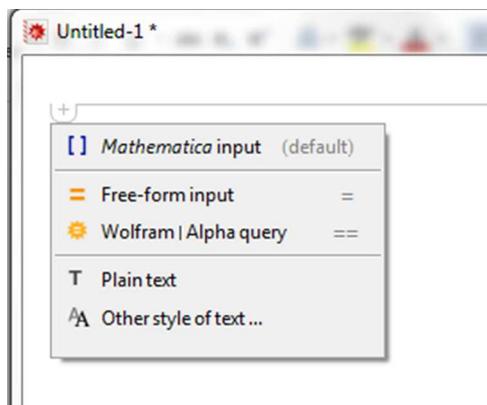
“When a teacher recently transferred to a different school . . . administrators demanded that the teacher leave behind all lesson plans and materials.”

A series of screenshots to illustrate the use of the “show the work” feature in Mathematica, which is available in Mathematica version 8 or later. This feature requires that your computer is connected to the internet⁹ and there is a daily limit of 100 requests¹⁰.

Step 1. Move cursor to “+” sign



Step 2. Select Wolfram | Alpha query (or enter “==”) to access the Wolfram Alpha website



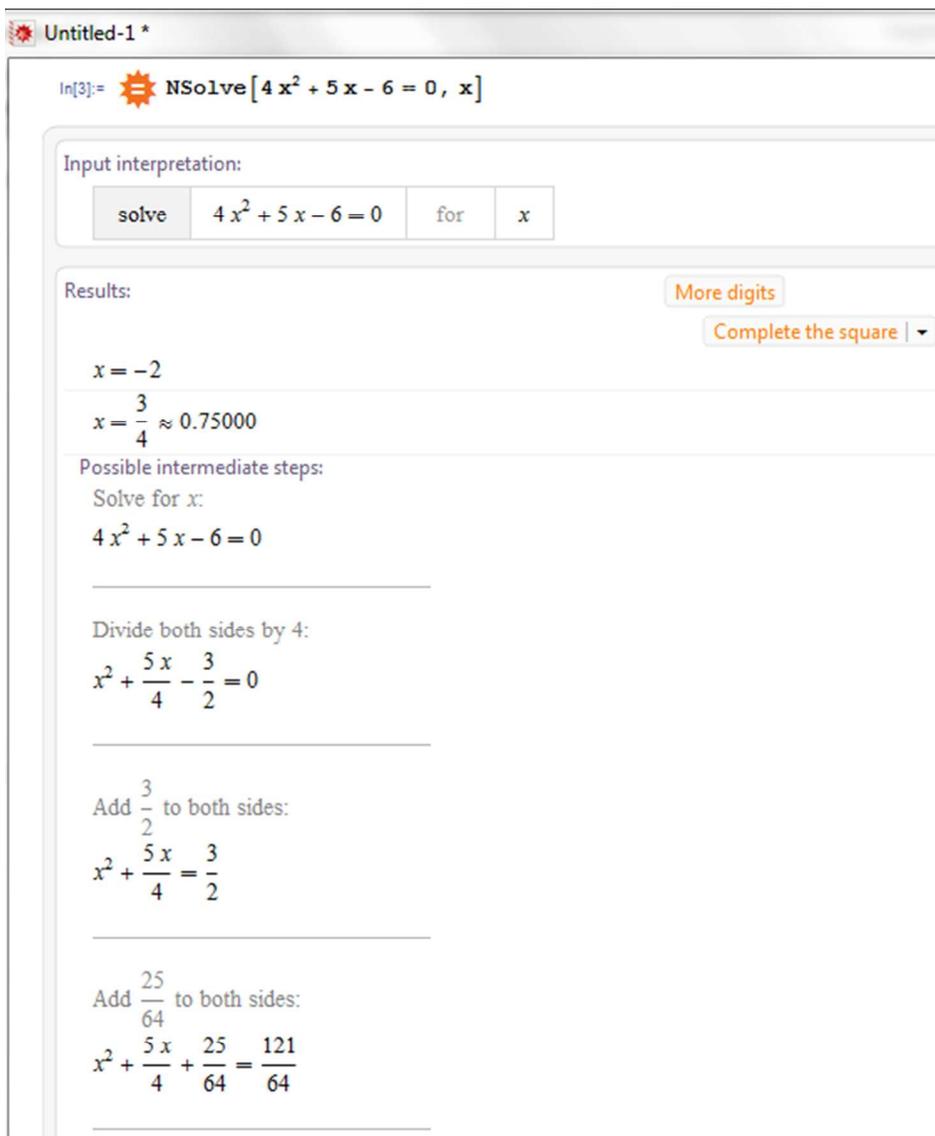
Step 3. Use *NSolve* command to enter equation to be solved, then select “step-by-step solution”



Step 4. Selected desired method to solve the equation; this option is not always available.



Selected "complete the square" method



Write the left hand side as a square:

$$\left(x + \frac{5}{8}\right)^2 = \frac{121}{64}$$

Take the square root of both sides:

$$x + \frac{5}{8} = \frac{11}{8} \quad \text{or} \quad x + \frac{5}{8} = -\frac{11}{8}$$

Subtract $\frac{5}{8}$ from both sides:

$$x = \frac{3}{4} \quad \text{or} \quad x + \frac{5}{8} = -\frac{11}{8}$$

Subtract $\frac{5}{8}$ from both sides:

Answer:

$$x = \frac{3}{4} \quad \text{or} \quad x = -2$$

References

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