

THE UNIVERSITY OF AKRON  
Theoretical and Applied Mathematics



Tutorial on the AcroT<sub>E</sub>X System of  
Online Assessment

D. P. Story

© 2003 [dpstory@uakron.edu](mailto:dpstory@uakron.edu)  
November 16, 2003

Version 1.1

## 1. Introduction

The **AcroTeX Bundle** is a collection of files that can be used—in conjunction with the proper software—for creating online exercises and quizzes in the Portable Document Format (PDF). There are three types of questions that can be posed by the **AcroTeX** system: (1) multiple choice; (2) math fill-in; and (3) text fill-in. A quiz can be any one of two types: (1) a quiz with *immediate feedback*, that is, as soon as the student enters an answer, it is immediately corrected; (2) a quiz with *delayed feedback*, that is the quiz is not marked until after the student has finished the quiz. Answers and solutions to questions can be optionally included.

This article is a brief tutorial on familiarizing the user with these types of quizzes and questions. Much of it is pretty obvious, except for the case of math fill-in question. In this case, the user must be careful to enter his or her answer using the correct syntax, which is pretty natural can consistent with standard math notation.

## 2. Multiple Choice Questions

This kind of question should be pretty much obvious.

### 2.1. Immediate Response Quiz

**Quiz** Which of the following mathematicians is considered to be one of the two founders of Calculus.

- (a) Euler            (b) Cauchy            (c) Newton            (d) Euclid

A solution can be attached to the correct answer, in this case, when you select the correct alternative, the document jumps to a solution page. For example:

**Quiz** Which of the following mathematicians is considered to be one of the two founders of Calculus.

- (a) Euler            (b) Cauchy            (c) Newton            (d) Euclid

## 2.2. Delayed Response Quiz

Click on “Begin”, make choices, then click on “End”. Then click on the “Correct” button, to get the corrections to your quiz.

Using the discriminant,  $b^2 - 4ac$ , respond to each of the following questions.

1. Is the quadratic polynomial  $x^2 - 4x + 3$  irreducible?

Yes

No

2. Is the quadratic polynomial  $2x^2 - 4x + 3$  irreducible?

Yes

No

**Notes:** After you have clicked on “Correct”, your quiz will be marked up. Any choice with either a green check mark, or a green fill circle is the correct answer. If the correct answer has a green bounding

rectangle, that answer has a solution attached, you can click on it to see a discussion of the solution.

### 3. Text Fill-in Questions

The text fill in is a question for which the student, that's you, is expected to enter a word or phrase.

**Quiz** Who was the first president of the United States?

**Notes:** Click on the “Ans” button to see the answer. If the button has a green border, and this one does, shift-click on the button to see the solution. The answer and/or the solution may or may not be given.

This kind of question can also be posed in a delayed feedback quiz. This will be illustrated in the math fill-in section below.

## 4. Math Fill-In Questions

We now come to the the most interesting type of question, the math fill-in. In order to communicate your answer to the computer, it is necessary to enter your answer in the correct syntax. The computer has limited intelligence, and does not know you, so it cannot intuit your answer. It must be entered syntactically correct.

### 4.1. Rules for Entering Math

When responding to a Math Fill-in question, you answer by typing in your answer. Use the following notation to enter your answers.

- Use  $+$ ,  $-$ ,  $/$  for addition, subtraction and division, respectively. Thus  $3 + \frac{x}{2}$  is typed as `3 + x/2`. Use parentheses to delimit the scope of your operations, type `x/(2+x)` to mean  $\frac{x}{2+x}$ . Without the parentheses, the computer would interpret `x/2 + x` as  $\frac{x}{2} + x$ .
- Multiplication can be denoted either by  $*$  or by juxtaposition: Type `4*x` or `4x` for  $4x$ .

- Use  $\wedge$  to indicate powers: Type  $4x^3$  for  $4x^3$ ;  $12x^{-6}$  for  $12x^{-6}$ . For more complex exponents, use parentheses to characterize the exponent, type  $4^{(x+1)}$  to mean  $4^{x+1}$ .
- Use parentheses to delimit the argument of a function; i.e., type  $\sin(x)$  rather than  $\sin x$ .
- Use parentheses to define the *scope* of an operation: For example, type  $4x(x^2+1)^3$  for  $4x(x^2 + 1)^3$ ;  $4^{(2x+1)}$  for  $4^{2x+1}$ .
- To raise a function to a power, such as  $\sin^2(x)$ , type either  $(\sin(x))^2$  or  $\sin^2(x)$ .
- You can also use brackets [ ] or braces { } to delimit a mathematics expression.
- Functions you may use:
  - Trig:  $\sin$ ,  $\cos$ ,  $\tan$ ,  $\cot$ ,  $\sec$ ,  $\csc$ ;
  - Inverse Trig:  $\asin$ ,  $\acos$ ,  $\atan$ ;
  - Log:  $\ln$  (natural log), or use  $\log$ ; e.g.  $\ln(x)$  or  $\log(x)$ , both of these refer to the natural logarithm.

- Exponential: The natural exponential function,  $e^x$ , can be entered as `exp(x)` or as `e^x`.
  - The absolute function, `abs(·)` can also be written in the usual way `|·|`; thus, you can type either `abs(x)` or `|x|`.
  - Misc.: `sqrt`, usage `sqrt(x)` for  $\sqrt{x}$  (or, use exponential notation: `x^(1/2)`).
- Spaces in answers are ignored, e.g., `4 x` is the same as `4x`; use spacing, however, to improve readability.

**Important:** When you enter your answer, use the variables referred to (or implied by) the statement of the question. For example, if the problem statement involves the variable  $x$ , use `x` in your answer, as needed; if the problem statement uses  $t$ , use `t` in your answer. If you enter a function of  $t$  when a function of  $x$  is expected, you will either receive an error message or there will be no response at all to the entry, so be careful.

## 4.2. Answers and Solutions

For fill-in questions, if the document author so wishes, answers and (optionally) solutions can be provided. The author provides an “Ans” button. This button is visible for a **shortquiz** and hidden for a **quiz**.

For a **shortquiz**, the “Ans” button can be clicked at anytime. In the case of a **quiz**, after a **quiz** has been completed, the hidden “Ans” buttons appear. Click on the button to get an answer to the problem.

Concerning solutions. If the “Ans” button has a green boundary, that means that question has a solution. Performing a **Shift-Click** on the “Ans” button causes the viewer to jump to the solution. For multiple choice questions, the boundary for the correct answer is colored green as well. Click on the answer field to jump to the solution.

## 4.3. Practice Math Fill-in Entry

Below is a quiz with immediate feedback for you to practice entering the responses using the correct syntax. Click on “Ans” to get the correct answer. Note the counter that keeps track of incorrect answers.

As you enter your answers, freely add spaces to your expression for clarity, e.g., you can type  $(x^2 + 2x + 1)^2$  instead of  $(x^2+2x+1)^2$ . All “white space” is stripped out of your answer before it is analyzed.

**Quiz** Answer each of the following. Passing is 100%.

1. Enter the expression  $23(x + 1)(x - 2)$ :



2. Enter the expression  $\frac{x^2 + 1}{2x - 1}$ :



3. Enter the expression  $[x + (3x + 4y)^2]^3$ :



4. Enter the expression  $\frac{x}{1 + \frac{c}{x}}$ :



5. Enter the expression  $(4x^2 + 1)^{4/3}$ :



6. Enter the expression  $(x^{y+1} + 1)^{y^2+1}$ :



7. Enter the expression  $\frac{3x^2 + x + 1}{1 + (2x + 1)^{y-1}}$ :



8. Enter the expression  $\frac{t \sin^2(t)}{1 + \cos^3(t^2)}$



How did you do?

### 4.4. A Quiz

Now that you have practiced, let's take a little quiz. Click on "Begin", enter your answers. You can edit your answers at any time before clicking on "End".

Answer each of the following. Passing is 100%.

1. Name *one* of the two people recognized as a founder of Calculus.



2. Enter the expression  $3(3x - 1)(2x - 1)$



3. Enter the expression  $\frac{x}{1 + \frac{x}{x+1}}$



4. Enter the expression  $2^{x+1} + 1$



Answers:



5. Enter the expression  $\frac{\tan(x) + \sec(x)}{(\sin(x) + \cos(x))^2}$



6. Enter the equation  $xy \sin(xz^2) + 4^{xy} = 4 \cos(xyz)$



7. Enter the expression  $\frac{xy^2}{1 + (1 + x)^{y^2+1}}$



8. Enter the expression  $\frac{1 - \frac{4}{3}t}{t^2 + 1} + \cos(t^2)$



Answers:



▶ Now you're are ready to begin practicing some real mathematics problems. Return to [AcroT<sub>E</sub>X Online Assessment Home Page](#) to determine where you should begin your practice and assessment.

**Directions:**

 [AcroT<sub>E</sub>X Online Assessment Page](#)

## Solutions to Problems

**Solution:** Yes, Isaac Newton and Gottfried Leibniz are the co-founders of Calculus. 

**Solution:** For  $x^2 - 4x + 3$ , the discriminant is  $b^2 - 4ac = (-4)^2 - 3(1)(3) = 16 - 9 = 7$ . Thus, the discriminant is  $b^2 - 4ac = 7 > 0$  is *positive*. This implies that the polynomial has two roots, hence, it can be factored into a product of two linear terms. Therefore, it is not irreducible; the answer is “No”. ◀

**Solution:** For  $2x^2 - 4x + 3$ , the discriminant is  $b^2 - 4ac = (-4)^2 - 3(2)(3) = 16 - 18 = -2$ . Thus, the discriminant is  $b^2 - 4ac = -2 < 0$  is *negative*. This implies that the polynomial has no roots, hence, it cannot be factored into a product of two linear terms. Therefore, it is irreducible; the answer is “Yes”. ◀

**Solution:** Yes, George Washington was the first President of the United States of America. ◀