LaTeX Testbank Preparation Macros

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The Document

The document must import the eGrade LaTeX macros. In LaTeX 2e that means that you should include the line

```
\usepackage{webtest}
```

in the preamble. In LaTeX 2.09 you would use the statement

```
\documentstyle[12pt, webtest]{article}
```

in the first line of the document. The file `webtest.sty` must reside in either the same folder as the LaTeX source file, or else in a folder that is searched for style files (on UNIX the list of these folders is set in the `TEXINPUTS` environment variable). Include a begin− and end−document statement. The body of the document itself is broken up into topics, which are marked with `\topic` statements, and questions within the topics. Thus the skeleton of a document would look like this:

```
\documentclass[12pt]{article}
\usepackage{webtest}

\begin{document}

\topic{The chain rule}

        A set of questions on the chain rule

\topic{The product rule}

        A set of questions on the product rule

        More topics…

\end{document}
```

Question Modes

Every question must begin with a statement of its *mode*. The mode is the description of the type of question that is being asked, which Web Tests uses to format the question on the page. The mode is entered in a `\mode` command. The words in the mode command may be all lower−case, or may start with upper case.

Multiple Choice

Sets a multiple choice question. Multiple choice questions must have an answer field and a number of choice fields set.

```
\mode{multiple choice}
\qu{What is the derivative of $x^2$?}
\choice{$3x$}
\choice{$4x$}
\choice*{$2x$} % Mark the correct answer with an asterisk
\choice{$e^x$}
```

Non Permuting Multiple Choice

Same as multiple choice except the choices are always offered in the order given.

```
\mode{non permuting multiple choice}
\qu{What is the derivative of $x^2$?}
\choice{$3x$}
\choice{$4x$}
\choice{$5x}
\choice*{None of the above} %% You want this to be listed at the end every time
```

Multiple Selection

Like multiple choice, but the correct answer consists of the selection of one or more appropriate choices. The user must identify all correct responses.

```
\mode{multiple selection}
\qu{Which of the following are {\it monic} polynomials}
\choice{$3x+1$}
\choice*{$x^2-1$}
\choice{$4x^2-1$}
\choice*{$x^3-2x+1$}
```

Non Permuting Multiple Selection

Same as multiple selection except the choices are always offered in the order given.

```
\mode{non permuting multiple selection}
\qu{Which of the following are {\it monic} polynomials}
\choice{$3x+1$}
\choice*{$x^2-1$}
\choice{$4x^2-1$}
\choice*{$x^3-2x+1$}
\choice{All of the above} %% You want this to be listed at the end every time
```

Formula

Sets a question that expects a formula to be typed in as an answer. The answer field holds a formula for the correct answer, and the grading routine checks that the given response evaluates to the same formula.

```
\mode{formula}
\qu{What is the derivative of $x^2+3x+1$?}
\ans{2x+3} %% Note that the answer should be in calculator syntax, NOT TeX
```

Equation

Accepts an equation as an answer (an equation is two formulas separated by the "=" sign). It's important that one side of the correct answer should consist of a single term only (either side can be used). The equation the student gives in response need not be in that form, however.

```
\mode{equation}
\qu{Find a straight line joining $(3,2)$ to $(5,9)$.}
\ans{y = (7/2)(x-3) + 2}
%% Note that the answer should be in calculator syntax, NOT TeX.
%% The student can answer "y – 2 = 3.5x – 10.5", but the author
%% must have one side of the equation with only a single variable
```

Plain Number

Accept a number. Variables and expressions may not be used.

```
\mode{plain number}
\qu{Add five and seven.}
\ans{12}
%% The expression "5+7" would be accepted in "formula" mode
%% but would not be accepted here
```

Formula Mod C

Sets a question which expects a formula to be typed in as an answer. The answer field holds a formula for the correct answer, and the grading routine checks that the given response evaluates to a formula which differs from the given answer by a constant value. Intended for use in questions asking the student to evaluate indefinite integrals.

```
\mode{formula mod c}
\qu{Calculate $\int 2x\, dx$}
\ans{x^2}  %% Note that "x^2+1"is a perfectly legitimate answer…
```

Restricted Formula

Sets a question which expects a formula to be typed in as an answer. The answer field holds a formula for the correct answer, and the grading routine checks that the given response evaluates to the same formula. However, only arithmetic, exponentiation are accepted.

```
\mode{restricted formula}
\qu{What is $\sin(\pi/4}$?}
\ans{sqrt(2)/2}
%% The response "sin(Pi/4) would be accepted by "formula" but
%% not by "restricted formula"
```

Multi Formula

Accepts an unordered list of formulas separated by semicolons.

```
\mode{multi formula}
\qu{Find the roots of $x^2 + 5x + 1$.}
\ans{ (−5 + sqrt(21))/2; (−5 − sqrt(21))/2 }
%% The two responses can be given in either order.
```

Ntuple

Accepts an ordered list of numbers or formulas separated by commas.

```
\mode{ntuple}
\qu{Find the intersection of $y=x+1$ and $y=2−x$.}
\ans{ (−1/2, 1/2) }
%% The order of the terms is counted. The parenthesis are optional.
%% The terms may be numbers or formulas.
```

Matrix

Lays out an *n* by *m* matrix of text fields which accept numbers or formulas.

```
\mode{matrix}
\qu{Find the inverse of
\[
       A = \left[\begin{array}{cc} 1 & 2 \\ 0 & 1 \end{array}\right]
\]}
\size{2, 2} %% List # rows then # columns
\ans{ 1, −2,
      0,  1}
%% Present the array as a comma−separated list running left
%% to right and top to bottom. Introducing some formatting
%% makes the TeX easier to read while writing it, but is
%% not required. Entries may be numbers of formulas.
```

Matching

The author provides a list of paired items and when the question is set the items are split apart and rearranged. The question requires the student to match the items into the correct pairs again

```
\mode{matching}
\qu{Match up the following polynomials with their factorizations:}
\match{$x^2 + 2x + 1$} \with{ $(x+1)(x+1)$}
\match{$x^2 − 1$} \with{ $(x+1)(x−1)$}
\match{$x^2 + 3x + 3$} \with{ $(x+2)(x+1)$}
```

Tagging Questions

Each question can be tagged with a name, comments, one or more hints, and a solution. These fields can be present for some questions and absent for others, and any of these fields can be used independently of the others. These fields can all be used with any question type.

Name

The name field is used entirely for internal organization of the questions. It will never be shown to students, but can be viewed by instructors browsing the database. There is no required format for the name.

```
\mode{formula}
\qu{What is the derivative of $x^2+3x+1$?}
\ans{2x+3}
\name{Grettlin & Pozzard, Ch 13, Sec 4}
```

Comment

If the comment field is set then this text will be shown to a student when they fail to that question completely correct. If the comment field is unset then the student is shown the correct answer when the question is answered wrongly. Thus the comment field can be used either (i) to conceal the correct answer and instead provide the student with a reference or a hint, (ii) to provide a fuller explanation of the correct answer, or (iii) to provide better formatting of the correct answer than the computer would automatically generate.

```
\mode{formula}
\qu{What is the derivative of $x^2+3x+1$?}
\ans{2x+3}
\comment{See Grettlin and Pozzard, Chapter 13, p 194.}
```

Hint

This field is needed only when the testbank is used in a Tutorial assignment. There can be one or more hints provided. The list of hints is in no particular order.

```
\mode{formula}
\qu{What is the derivative of $x^2+3x+1$?}
\ans{2x+3}
\hint{Differentiate the expression term by term}
\hint{Remember the derivative of $x^2$ is $2x$}
\hint{The derivative of the constant term is zero}
```

Solution

A complete worked solution to the problem. This field is needed only when the testbank is used in a Tutorial assignment.

```
\mode{formula}
\qu{What is the derivative of $x^2+3x+1$?}
\ans{2x+3}
\hint{Differentiate the expression term by term}
\hint{Remember the derivative of $x^2$ is $2x$}
\hint{The derivative of the constant term is zero}
\solution{
\[
       \frac{d}{dx}( x^2+3x+1 ) =
              \frac{d}\frac{dx}x^2 + \frac{d}\frac{dx}3x + \frac{d}\frac{dx}1 =
              2x + 3
\]}
```