

THE UNIVERSITY OF AKRON
Mathematics and Computer Science

The Web and Exerquiz Packages
Manual of Usage

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1. Introduction

The `web` and `exerquiz` packages were written in preparation for a two-day workshop on L^AT_EX/PDF that I gave at the College of the Redwoods, April 30-May 1, 1999, at the invitation of David Arnold. The workshop forced me to take many of the basic macros that I had developed in plain T_EX, and convert them to L^AT_EX.

The goals of the two packages are (1) to create an attractive, easy-on-the-eye page layout suitable for the WWW and (2) to make it very easy to create interactive exercises and quizzes in the PDF format.

It is hoped that these packages will be useful to educators who want to post interactive materials for their students on the WWW.

Please contact me at `dpstory@uakron.edu` should you encounter any problems, or have suggestions to make.

Now, I really must get back to work. ☞

2. The Web Style Package

The purpose of the `web` package is to create a page layout for documents meant to be read over the WWW and which are *not* (necessarily) *intended to be printed*.

The package heavily depends on Sebastian Rahtz' `hyperref` package. `Web` style redefines `\maketitle` and `\tableofcontents` in a more web friendly way; it colors the section headings, and inserts `\bullets` (●) at the `\subsubsection` level. This, to my eyes, is very attractive.

Additionally, certain navigational devices—a navigational bar and some direction irons—are included in the package.

The capabilities of `web.sty` and its options are discussed below.

Any comments and suggested improvements (new features) would be greatly appreciated.

2.1. Basic Usage

To use the `web.sty` package, insert into the preamble of your document the following:

```
\usepackage[dvipsone]{web} % or dvips
```

The optional argument above defines the driver to be used; currently, the `web` package supports only two drivers: `dvipsone`, the dvi-to-ps converter by Y&Y, Inc., (<http://www.yandy.com/>), and `dvips`, the freeware dvi-to-ps converter.

Options for for PDF_TE_X and `dvipdfm` will be added as time permits.

► You can set your driver option in one of three ways.

- Pass as a local option:

```
\usepackage[dvipsone]{web}, or
\usepackage[dvips]{web}.
```

- Pass as a global option:
`\documentclass[dvips]{article}`, or
`\documentclass[dvipsone]{article}`.
- Create the file `web.cfg` with the single command in it:
`\ExecuteOptions{dvipsone}` or
`\ExecuteOptions{dvips}`.
Place the file `web.cfg` in any folder where L^AT_EX looks for input files. Then, you need only type `\usepackage{web}`.

The macros of `web.sty` have been extensively tested using the Y&Y T_EX System for the `dvipsone` option and a MikT_EX System (<http://www.inx.de/~cschenk/miktex/>) for the `dvips` option.

► The package has been tested using `\documentclass{article}`.

2.2. Hyperref Options

The `web` package loads `hyperref` into the document and sets some selected options of that package; therefore, including the `hyperref` package is not needed in the preamble of your own document.

Any additional `hyperref` options that are needed can be introduced into the package using `hyperref`'s `\hypersetup` macro, for example,

```
\documentclass{article}
\usepackage[dvipsone]{web}    % or dvips

% Declare additional hyperref options using \hypersetup
\hypersetup{pdfpagemode=None,bookmarksopen=false}
```

Documentation of the options that `hyperref` recognizes can be had by either L^AT_EXing the file `hyperref.dtx`, or by getting a copy of the *The L^AT_EX Web Companion* [4] by Michel Goossens *et al.*

2.3. The Title Page and TOC

The title page is constructed from the values of the macros: `\title`, `\author`, `\university`, `\email`, and `\version`. The values of some of the macros `\title` and `\author` are also transferred to the PDF-DocInfo section of the Acrobat Reader/Exchange.

Additionally, the values of `\subject` and `\keywords` are inserted into the PDFDocInfo section.

• Basic Information Macros

Just fill in the values of all the basic macros briefly described above. For example, the following is a copy of the title information for this document:

```
% \title,\author,\subject,\keywords are sent to DocInfo
\title{The Web and Exerquiz Packages\Manual of Usage}
\author{D. P. Story}
\subject{How to create on-line exercises and quizzes}
\keywords{LaTeX,hyperref,PDF,exercises,quizzes}
```

```
% \university,\email,\version are used only in title page
\university{THE UNIVERSITY OF AKRON\
  Mathematics and Computer Science}
\email{dpstory@uakron.edu}
\version{1.00}
```

► The `\title`, `\author`, `\subject`, `\keywords` are a convenient way of entering information in the Document Information fields—see

File > Document Info > General ... (Ctrl+D)

in the Acrobat Reader/Exchange.

If `\title` contains control sequences that do not expand to the Standard PDFDocEncoding character set, Distiller will be thrown into a tailspin; for this reason, the `\title` field has an optional argument.

```
\title[title doc info]{title of article}
```

The first argument gets written to the PDFDocInfo field, the second gets typeset on the title page. (`web.sty` does change the end of line command, `\\`, into an empty string.)

Having entered the information you can now type the standard sort of L^AT_EX commands of `\maketitle` and `\tableofcontents`:

```
\begin{document}
\maketitle
\tableofcontents
...
\end{document}
```

• Redesigning `\maketitle`

You can redesign the title page to suit your needs. You can rearrange the basic macros on the page, or include a graphic, or change the background color. Just use

```
\renewcommand\maketitle{...your design...}
```

When making the design, it is useful to know that the `web` package uses `\hypertarget` to create a named destination, `'webtoc'`, in the table of contents, Use this `webtoc` to jump to the table of contents using the macro `\hyperlink`.

• The `nodirectory` option

The inclusion of `\tableofcontents` is optional. The article you write may be short, or perhaps it may just be a collection of exercises and quizzes. In this case, you may not want a table of contents.

If you do not want a table of contents, you would not include `\tableofcontents` just after `\begin{document}`. Without a table of contents, you may as well turn off the directory listing on the cover page as well. Use the `nodirectory` option to do this:

```
\usepackage[dvips,nodirectory]{web} % or dvipsone
```

The directory listing does not appear on the title page.



- **The `latexoc` option**

If you don't like the default design for the table of contents, you can always recover the standard L^AT_EX table of contents by using the `latexoc` option with the `web` package:

```
\usepackage[latexoc]{web}
```

Should you want to go with this option, you might consider including

```
\hypersetup{linktocpage}
```

Look at the table of contents with and without this `hyperref` option to decide which you prefer.

2.4. Navigational Aids

The `web` package offers several navigational aids to help you move around.

- **A Navigational Bar**

This might be a good chance to bring up an option available with the `web` style. This lecture was compiled with the `navibar` option. This file was L^AT_EXed with

```
\usepackage[dvips,navibar]{web}
```

the result is the navigation bar you see at the bottom of the page.

► Here is (almost) the preamble of this document.

```
\documentclass{article}
\usepackage[dvips,navibar]{web} % <- navibar option

\hypersetup{pdfpagemode=None,bookmarksopen=false}

\title{Lecture \#4: \\\Creating On-line Exercises}
\author{D. P. Story}
\subject{How to create on-line exercises with solutions}
\keywords{LaTeX, hyperref, PDF, exercises, quizzes}
\version{1.00}
\email{dpstory@uakron.edu}
\university{THE UNIVERSITY OF AKRON\\
  Mathematics and Computer Science}
```

- **Direction Icons**

The up arrow you see in the upper right-hand corner was constructed using colored rules and the AMS symbol font, `amssymb`. The uparrow icon was produced by the command:

```
\insertnaviiconhere{\ArrowUp{\hyperlink{webtoc}}}
```

Or, more generally,

```
\insertnaviiconhere{\ArrowUp{link_command}}
\insertnaviiconhere{\ArrowDown{link_command}}
```

This will insert direction icons on the current page (I hope).

If you want a running direction icon you can use

```
\insertnaviiconhereafter{\ArrowUp{link_command}}
\insertnaviiconhereafter{\ArrowDown{link_command}}
```

- To discontinue a running arrow icon type

```
\defaultpageheader
```

one the page you want the arrow(s) to disappear.

3. The Exerquiz Package

The `exerquiz` package contains a series of macros for creating on-line exercises, short quizzes (with or without solutions), and longer quizzes that are graded using JavaScript.

3.1. On-line Exercises

Please in the preamble of your document

```
\usepackage{exerquiz}
```

This defines `exercise` and `solution` environments, the latter being nested inside the former.

```
\begin{exercise}
Your Question.
\begin{solution}
The Solution to Your Question
. . . . .
. . . . .
. . . . .
\end{solution}
\end{exercise}
```

Here is an example of the usage.

EXERCISE 1. Evaluate the integral $\int x^2 e^{2x} dx$.

- Questions and solutions are kept together *à la Knuth*. The solutions are written to the file `\jobname.sol` verbatim then input back using the macro `\includesolutions`.

- You can redefine the counter to include the section number. For example.

```
\renewcommand{\theexno}{\thesection.\arabic{exno}}
```

can be placed in the preamble of your document. In this case, the above exercise would appear as EXERCISE 3.1.

- The usual cross-referencing mechanisms for L^AT_EX, i.e., using `\ref` and `\pageref`, work as expected.

For example, the label `\label{ex:int}` was placed just after `\begin{exercise}` on the previous page, let us now reference Exercise 1, on 7.

```
let us now reference Exercise~\ref{ex:int},
on~\pageref{ex:int}.
```

Of course, the nicer looking variations can be done as well: See EXERCISE 1.

```
\hyperref[ex:int]{\textsc{Exercise~\ref*{ex:int}}}
```

The *-form of `\ref` was used to turn off the redundant link creation. (`\hyperref` would normally make the `\ref` macro into a link.)

3.2. Quizzes with Immediate Response

The `shortquiz` environment is used to create a multiple choice question with immediate response. The syntax for this environment is as follows:

```
\begin{shortquiz}           % begin shortquiz
...Question goes here...
\begin{answers}{num_cols}  % begin proposed answers
...
\Ans0 <an incorrect answer> & % a wrong answer
...
\Ans1 <a correct answer> & % the right answer
...
\end{answers}              % end listing of answers
\end{shortquiz}            % end shortquiz
```

The parameter `num_cols` is the number of columns you want to typeset your multiple choice responses in.

This type of quiz is suitable as a quiz in-line question of the reader, perhaps after explaining some concept. Quizzes can be used to direct the reader's attention to an important point.

► Here is an example of the `shortquiz` environment. Responses are graded without comment using JavaScript.

Quiz. Which of the following is the $\frac{d}{dx}\sin(x^3)$?

(a) $\sin(3x^2)$ (b) $\cos(x^3)$ (c) $3x^2 \cos(x^3)$ (d) $3x^2 \cos(3x^2)$

The verbatim listing follows:

```
\begin{shortquiz}          % begin shortquiz environment
Which of the following is the  $\frac{d}{dx}\sin(x^3)$ ?
\begin{answers}{4}         % 4 columns of answers
  \Ans0  $\sin(3x^2)$  & % \Ans0 is a false answer
  \Ans0  $\cos(x^3)$  &
  \Ans1  $3x^2\cos(x^3)$  & % \Ans1 is the correct answer
  \Ans0  $3x^2\cos(3x^2)$ 
\end{answers}              % end answers environment
\end{shortquiz}           % end shortquiz environment
```

Below is a two-column example. The `answers` environment uses `tabular` with `p{<width>}` to set up the columns. The `\parboxes` are typeset ragged right.

Quiz. Which of the following best describes Augustin Cauchy?

- | | |
|--|---|
| (a) He developed the Calculus while his University was closed for the plague. | (b) Given credit for first using the functional notation $f(x)$. |
| (c) He created the “bell-shaped curve” and first used the method of least squares. | (d) He first formulated a precise definition of the limit and continuity of a function. |
| (e) Gave a rigorous definition of the definite integral—an integral that now bears his name. | (f) His notation for the derivative and the integral is used even to this day. |

The result is a nicely aligned set of paragraphs.

3.3. Quizzes with Solutions

Another type of quiz that is easy to implement in PDF is the multiple choice quiz with immediate response with solution given. This too is a `shortquiz` environment:

```
\begin{shortquiz}
...Question goes here...
\begin{answers}[<name>]{<num_cols>}
...
\Ans0 <an incorrect answer> &
...
\Ans1 <a correct answer> &
...
\end{answers}
\begin{solution}
...Solution to correct answer goes here...
\end{solution}
\end{shortquiz}
```

The `<name>` is a name used to create a hypertext jump to the solution; `<name>` will be the “named destination.” As before, `<num_cols>` is the number of columns to typeset the answers in.

The following example illustrates the quiz with solution.

Quiz. Define a function $f(s) = 4s^3$ and another function $F(t) = t^4$. Is F an antiderivative of f ?

- (a) Yes (b) No

The verbatim listing:

```
\begin{shortquiz}
Define a function  $f(s)=4s^3$  and another
function  $F(t)=t^4$ . Is  $F$  an antiderivative of  $f$ ?
\begin{answers}[quiz:anti]{4}
```

```

\Ans1 Yes &\Ans0 No
\end{answers}

\begin{solution}
The answer is 'Yes'. The definition requires that
$$
      F'(x) = f(x) \quad \text{for all } x,
$$
well, let's check it out.

The definition of  $f$  is  $f(s)=4s^3$  and so  $f(x)=4x^3$ .

The definition of  $F$  is  $F(t)=t^4$  and so, by the rules
of differentiation,  $F'(t)=4t^3$ . Thus,  $F'(x)=4x^3$ .
Therefore,
$$
      F'(x) = 4x^3 = f(x) \quad \text{for all } x,
$$
as required by the definition.
\end{solution}
\end{shortquiz}

```

Quizzes with/without solutions can be mixed together and several quizzes can be combined using the `questions` environment, defined in `exerquiz`. For example,

Quiz. Determine the LCD for each of the following.

1. $\frac{3x}{2y^2z^3} - \frac{2}{xy^3z^2}$.

(a) LCD = $2xy^5z^5$	(b) LCD = $2y^3z^3$
(c) LCD = $2xy^3z^3$	(d) LCD = $2xy^3z^5$

2. $\frac{x+y}{3x^{3/2}y^2} - \frac{x^2+y^2}{6xy^4}$.

(a) LCD = $18x^{3/2}y^4$	(b) LCD = $6x^{3/2}y^4$
(c) LCD = $18xy^4$	(d) LCD = $6xy^4$

An abbreviate verbatim listing follows.

```

\begin{shortquiz}
Determine the LCD for each of the following.
\begin{questions}
\item  $\frac{3x}{2y^2z^3} - \frac{2}{xy^3z^2}$ .
\begin{answers}2
...
\end{answers}
\item  $\frac{x+y}{3x^{3/2}y^2} - \frac{x^2+y^2}{6xy^4}$ .
\begin{answers}[quiz:LCB]2
...
\end{answers}

```

```

\begin{solution}
If you erred on this one, ... ..
\end{solution}
\end{questions}
\end{shortquiz}

```

• Redefining Short Quiz Title

You can temporarily change the title for the `shortquiz` environment by redefining the macro `\sqlabel`; for example, the default definition of this macro is

```
\newcommand\sqlabel{\textcolor{red}{Quiz.}}
```

The syntax for redefining `\sqlabel` is

```
\renewcommand\sqlabel{...new code goes here...}
```

You can redefine the *default* label as well; the default label is the title label that `shortquiz` uses when `\sqlabel` is *not present*. The default label is `\eq@sqlabel` and must be redefined using the macro `\renewcommand`. The best place for this to be done is the preamble. The syntax:

```

\makeatletter      % make 'at'=@ a normal letter
\renewcommand\eq@sqlabel{...new code goes here...}
\makeatother      % make 'at'=@ something special(other)

```

To change the entire document to use 'Exam' instead of 'Quiz', make the following changes in the preamble:

```

\makeatletter
% change default quiz title to 'Exam'
\renewcommand\eq@sqlabel{\textcolor{red}{Exam.}}
% change default running header for solutions
\renewcommand\eq@qslrunhead{Solutions to Exams}
% change quiz solutions return label
\renewcommand\eq@rsqlabel{End Exam}
% change solutions label
\renewcommand\eq@qsllabel{%
  \string\textbf{Solution to Exam:}}
\makeatother

```

3.4. Graded Quizzes using JavaScript

Use the `quiz` environment to create graded quizzes. In this case, several (many) questions are bundled together. The student takes the quiz, his/her responses are recorded by JavaScript. Upon completion of the quiz, the total score is reported to the student.

```

\begin{quiz}{quizfieldname}
The preamble to the questions goes here.
\begin{questions}
\item State first question....
\begin{answers}4
% <- 4 column format

```

```

\Ans0 ... &\Ans1 ... &\Ans0 ... &\Ans0 ...
\end{answers}
...
\item n th question....
\begin{answers}4 % <- 4 column format
\Ans0 ... &\Ans1 ... &\Ans0 ... &\Ans0 ...
\end{answers}
\end{questions}
\end{quiz}

```

► Following the quiz, or anywhere in the document, place the macro `\TextField`, defined in `hyperref`, to display the results of the quiz:

```
\TextField[width=3in,name=quizfieldname,default=Score:]{}
```

The value of the ‘name’ key must match the `quizfieldname` defined in the argument of the `quiz` environment.

The `\TextField` macro takes two arguments, we need only the first—the second is left empty.

This `\TextField` can be modified by changing the options; the layout of the field can be changed as well using the `\LayoutTextField`—more later.

• Quiz using Links

There are actually two variations on this type of quiz, one uses links, the other uses radio button fields.

Below is an example of a quiz with links. You must click on ‘Begin Quiz’ to initialize the quiz. Not doing so, brings forth an error message. When finished, click on ‘End Quiz’.

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

1. Is the quadratic polynomial $x^2 - 4x + 3$ irreducible?
 - (a) Yes
 - (b) No
2. Is the quadratic polynomial $2x^2 - 4x + 3$ irreducible?
 - (a) Yes
 - (b) No
3. How many solutions does the equation $2x^2 - 3x - 2 = 0$ have?
 - (a) none
 - (b) one
 - (c) two

End Quiz

While you are taking the test, and before you click on ‘End Quiz’, you can change your answers. A message box comes out, gives you your original choice, and asks you whether you really want to change your answer.

- **Quiz using Checkboxes**

You may be thinking that such a quiz format—one in which the student cannot see his/her choices—is not very good. It is perhaps adequate for two or three quick questions. For a longer quiz format, one would like to see a “checkbox” format.

A quiz with a checkbox format can be obtained using the `*-form` of the `quiz` environment:

```
\begin{quiz}*{quizfieldname}  
...same format as before...  
\end{quiz}
```

The following example was used at the `AcroTeX` Web Site to demonstrate how to use FDF (Forms Data Format) to process Adobe form data.

• **An Example**

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

1. Calculate the limit, if it exists, otherwise, state that it does not exist (d.n.e.).

$$\lim_{x \rightarrow 3} \frac{\sqrt{3x}(x^2 - 4)^2}{x^2 - 2x - 1}.$$

75 $\frac{75}{2}$ 25 d.n.e.

2. Calculate the limit, if it exists, otherwise, state that it does not exist (d.n.e.).

$$\lim_{t \rightarrow 2} \frac{t^2 - 4}{t - 2}.$$

2 $+\infty$ 4 d.n.e.

3. Calculate the limit, if it exists, otherwise, state that it does not exist (d.n.e.).

$$\lim_{t \rightarrow 2^-} \frac{t^2}{t - 2}.$$

$-\infty$ $+\infty$ 4 d.n.e.

4. Using one-sided limit techniques, determine whether the limit $\lim_{x \rightarrow 2} f(x)$, where

$$f(x) = \begin{cases} |x^2 - 5| & \text{for } x \leq 2 \\ \frac{x - 2}{x - 2} & \text{for } x > 2 \end{cases}$$

If the limit exists, state its value.

-1 0 1 d.n.e.

5. Calculate the limit, if it exists, otherwise, state that it does not exist (d.n.e.).

$$\lim_{x \rightarrow -2} \frac{\sqrt{x+8} - \sqrt{6}}{x+2}$$

$\frac{1}{\sqrt{6}}$ $\frac{\sqrt{6}}{12}$ $\frac{1}{2}$ d.n.e.

6. There is some function f and some number a in the domain of f such that

$$f'(a) = \lim_{x \rightarrow -2} \frac{\sqrt{x+8} - \sqrt{6}}{x+2}$$

Name the function f and the number a .

$$\begin{array}{ll} f(x) = \sqrt{x+8}; a = -2 & f(x) = \sqrt{x}; a = -2 \\ f(x) = \sqrt{x+8}; a = 0 & f(x) = \sqrt{x+8}; a = 2 \end{array}$$

End Quiz

- **The check appearance**

The appearance of the ‘check’ can be chosen using the `\symbolchoice` macro of the `exerquiz` package. The above quiz was generated by

```
\symbolchoice{diamond}
```

The permissible values for the argument of `\symbolchoice` are `check` (the default), `circle`, `cross`, `diamond`, `square`, and `star`.

- **Modifying the Output Field**

We can modify the output field a couple of ways: (1) by changing some of the options in `\TextField`; (2) changing the macro definition of `\LayoutTextField`.

- **Modifying `\TextField`**

- ▶ **`\TextField` Options: Dimension Related**

<code>height</code>	<code>dimen</code>		height of box
<code>width</code>	<code>dimen</code>		width of field box

- ▶ **`\TextField` Options: Text Related**

<code>align</code>	<code>name</code>	<code>0</code>	<code>0</code> = left-aligned, <code>1</code> = centered <code>2</code> = right-aligned
<code>charsize</code>	<code>dimen</code>	<code>10pt</code>	Font size of text

- ▶ **`\TextField` Options: Color Related**

<code>backgroundcolor</code>	<code>RGB</code>	<code>1 1 1</code>	Color of background color.
<code>bordercolor</code>	<code>RGB</code>	<code>1 0 0</code>	Color of the border.
<code>color</code>	<code>RGB</code>	<code>0 0 0</code>	Color of text within field
<code>borderstyle</code>	<code>name</code>	<code>S</code>	<code>S</code> (solid), <code>B</code> (beveled), <code>I</code> (insert), <code>U</code> (underlined)

- ▶ **`\TextField` Options: Style Related**

<code>borderwidth</code>	<code>number</code>	<code>1</code>	Width of the border of the box (in points)
--------------------------	---------------------	----------------	--

- ▶ **`\TextField` Options: Field Related**

<code>default</code>			default value of the field
<code>name</code>	<code>name</code>		name of the field
<code>readonly</code>	<code>boolean</code>	<code>false</code>	set read-only switch

- **Examples**



```
\TextField[width=2in,name=QuizTotal,
bordercolor=0 0 1,default=Score:]{}
```



```
\TextField[width=2in,name=Example,bordercolor=0 0 1,
```

```
backgroundcolor=0.98 0.92 0.73,color=1 0 0,
default=Text Field with Various Options]{}

```



```
\TextField[width=1.25in,name=Example,bordercolor=1 1 1,
backgroundcolor=.753 .753 .753,color=0 0 1,
borderstyle=B,align=1,
default=Your Score goes here]{}

```

A complete list of options comes with the `hyperref` documentation; or see Michel Goossens *et al* [4], entitled *The L^AT_EX Web Companion*

- **Modifying `\LayoutTextField`**

The macro `\LayoutTextField` allows you to design how your text box is formatted by T_EX. The default definition for `hyperref` is

```
\newcommand\LayoutTextField[2]{#1 #2}

```

The first argument is the label, the second is the textfield. For example, above definition yields:

Enter your name:

```
\TextField[width=2.5in,name=Name]{Enter your name: }

```

The `exerquiz` package redefines this to

```
\renewcommand\LayoutTextField[2]{% label, field
\medskip\noindent#2\par\medskip}

```

Finally, the field examples given earlier had the following definition for `\LayoutTextField`:

```
\newcommand\redpoint{\par\medskip\noindent
\makebox[\parindent][l]{\large\textcolor{red}
{\blacktriangleright}}}
\renewcommand\LayoutTextField[2]{\redpoint
\raisebox{-3pt}{#2}}

```

I lowered the text field to line up better with the `amssymb` symbol `\blacktriangleright` (►), which is painted red. In this way we obtain



- **Redefining the Quiz Titles**

It is possible to redefine the quiz titles and other labels if desired.

▶ Locally:

```
\renewcommand\bqlabel{Begin Exam}  
\renewcommand\eqlabel{End Exam}
```

▶ Globally:

```
\makeatletter  
\renewcommand\eq@bqlabel{Begin Exam}  
\renewcommand\eq@eqlabel{End Exam}  
\makeatother
```

References

- [1] Leslie Lamport, *L^AT_EX: A Document Preparation System* (2nd ed.), Addison-Wesley Publishing Company, 1994, ISBN 0-201-52983-1.
- [2] Michel Goossens, Frank Mittelbach and Alexander Samarin, *The L^AT_EX Companion*, Addison-Wesley Publishing Company, 1994, ISBN 0-201-54199-8.
- [3] Michel Goossens, Sebastian Rahtz, and Frank Mittelbach, *The L^AT_EX Graphics Companion*, Addison-Wesley Publishing Company, 1997, ISBN 0-201-85469-4.
- [4] Michel Goossens, and Rahtz, Sebastian, with Gurari, Eitan, Moore, Ross, and Sutor, Robert, *The L^AT_EX Web Companion*, Addison Wesley Longman, Reading, Massachusetts, USA, 1999. ISBN: 0-201-43311-7. 4, 16
- [5] Helmut Kopka and Patrick W. Daly, *A Guide to L^AT_EX2e* (2nd ed.), Addison-Wesley Publishing Company, 1995, ISBN 0-201-43777-X.
- [6] Donald E. Knuth, *The T_EXbook*, Addison-Wesley Publishing Company, 1987, ISBN 0-201-13448-9.
- [7] Thomas Merz, *Web Publishing with Acrobat/PDF*, Springer-Verlag Berlin Heidelberg New York, 1998, ISBN 3-540-63762-1.

Solutions to Quizzes

Solution to Quiz: The answer is ‘Yes’. The definition requires that

$$F'(x) = f(x) \quad \text{for all } x,$$

well, let's check it out.

The definition of f is $f(s) = 4s^3$ and so $f(x) = 4x^3$.

The definition of F is $F(t) = t^4$ and so, by the rules of differentiation, $F'(t) = 4t^3$. Thus, $F'(x) = 4x^3$. Therefore,

$$F'(x) = 4x^3 = f(x) \quad \text{for all } x,$$

as required by the definition.

End Quiz

Solution to Quiz: If you erred on this one, more than likely it was on the appropriate multiplicative constant: 6 not 18. At least that's what I'm betting on.

The instructions of the LCD Algorithm said to *completely factor the denominator*. Here's a list of the factors

$$\underbrace{3, x^{3/2}, y^2}_{\text{first term}}, \underbrace{2, 3, x, y^4}_{\text{second term}}$$

Let's rearrange them

$$2, 3, 3, x, x^{3/2}, y^2, y^4$$

Now drop duplicate factors—that's the 3. Oops! I did mention dropping identical factors, didn't I?

$$2, 3, x, x^{3/2}, y^2, y^4$$

Now, group together all terms which have the same base, then drop, from each of these groups all terms but the one with the highest power. We obtain then,

$$2, 3, x^{3/2}, y^4$$

The LCD is the product of same:

$$\text{LCD} = (2)(3)x^{3/2}y^4 = 6x^{3/2}y^4.$$

Solution Notes: Alternative (a) will work as a common denominator, but it is not the least common denominator. If you use (a), you will be working with larger numbers than is really necessary.

End Quiz

Solutions to Exercises

Exercise 1. We evaluate by **integration by parts**:

$$\begin{aligned}\int x^2 e^{2x} dx &= \frac{1}{2} x^2 e^{2x} - \int x e^{2x} dx && u = x^2, dv = e^{2x} dx \\ &= \frac{1}{2} x^2 e^{2x} - \left[\frac{1}{2} x e^{2x} - \int \frac{1}{2} e^{2x} dx \right] && \text{integration by parts} \\ &= \frac{1}{2} x^2 e^{2x} - \frac{1}{2} x e^{2x} + \frac{1}{2} \int e^{2x} dx && u = x^2, dv = e^{2x} dx \\ &= \frac{1}{2} x^2 e^{2x} - \frac{1}{2} x e^{2x} + \frac{1}{4} e^{2x} && \text{integration by parts} \\ &= \frac{1}{4} (2x^2 - 2x + 1) e^{2x} && \text{simplify!}\end{aligned}$$

Exercise 1