

# A Sample Article

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## Abstract

This article illustrates many features of a mathematics document created with Scientific Word or Scientific WorkPlace.

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|   |   |    |
|---|---|----|
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# 1 A Sample Article

This document contains a wide range of symbols and constructs. It illustrates the many possibilities available to you. The document is set up to compile with all installation choices. In particular, it does not include any characters from the Latin 1 and Extended Latin 1 character sets, so it will compile correctly with the English-only version of the installation.

## 1.1 Mathematics and Text

Let  $H$  be a Hilbert space,  $C$  be a closed bounded convex subset of  $H$ ,  $T$  a nonexpansive self map of  $C$ . Suppose that as  $n \rightarrow \infty$ ,  $a_{n,k} \rightarrow 0$  for each  $k$ , and  $\gamma_n = \sum_{k=0}^{\infty} (a_{n,k+1} - a_{n,k})^+ \rightarrow 0$ . Then for each  $x$  in  $C$ ,  $A_n x = \sum_{k=0}^{\infty} a_{n,k} T^k x$  converges weakly to a fixed point of  $T$  [5].

In this situation, we would also like to cite [1, 2, 3, 4, 6], but we do so only to demonstrate a citation with multiple entries.

## 1.2 In-line and Displayed Mathematics

The equation

$$u_{tt} - \Delta u + u^5 + u|u|^{p-2} = 0 \text{ in } \mathbf{R}^3 \times [0, \infty[. \tag{1}$$

is numbered and it also has the label “wave”. You can use this label to jump to this equation using hypertext links. You can reference this equation within your document as equation 1.

There are two sets of L<sup>A</sup>T<sub>E</sub>X parameters governing mathematical displays. The spacing left above and below a display depends on whether the lines above or below are short or long.

Short above

$$x^2 + y^2 = z^2$$

short below.

Long above. This may depend on your margins. Avoid wrapping.

$$\sin^2 \theta + \cos^2 \theta = 1$$

and long below. You don’t have to worry about this line being long enough in most circumstances because we’ve tried to ensure that it will wrap no matter how wide you have your margins set.

## 1.3 Multi-Line Displays

*Scientific Word* and *WorkPlace* provide a range of alignment options for multiline mathematical displays. Here is a series of multiline displays.

$$x = 17y \tag{1}$$

$$y > a + b + c + d + e + f + g + h + i + j + k + l + m + n + o + p \tag{2}$$

$$x \ll y_1 + \dots + y_n$$

$$\leq z$$

$$y = a + b + c + d + e + f + g + h + i + j + k + l + m + n + o + p$$

$$\begin{aligned}
 w + x + y + z &= \\
 & a + b + c + d + e + f + g + h + i + j + \\
 & k + l + m + n + o + p
 \end{aligned}$$

If  $f(x) = x + 1$ , then we will have

$$f([x + 1]/[x + 2]) = \{[x + 1]/[x + 2]\} + 1 = (2x + 3)/(x + 2)$$

$$\begin{aligned}
 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12 \\
 + 13 + 14 + 15 + 16 + 17 + 18 + 19 + 20 &= 190
 \end{aligned}$$

$$\max(f, g) = \frac{f + g + |f - g|}{2}, \quad (3)$$

$$\max(f, -g) = \frac{f - g + |f + g|}{2}. \quad (4)$$

$$(a + b)^{n+1} = (a + b)(a + b)^n = (a + b) \sum_{j=0}^n \binom{n}{j} a^{n-1} b^j \quad (5)$$

$$= \sum_{j=0}^n \binom{n}{j} a^{n+1-j} b^j + \sum_{j=1}^n \binom{n}{j-1} a^{n-1} b^j \quad (6)$$

$$= \sum_{j=0}^n \binom{n+1}{j} a^{n+1-j} b^j. \quad (7)$$

The equations in the display immediately above are (5), (6), and (7).

You can have subequation numbering generated automatically, illustrated in the following:

$$x = a + b \quad (8a)$$

$$y = c + d \quad (8b)$$

$$z = e + f \quad (8c)$$

This is text between the two sets of equations. The following set of equations continues the numbering from the set above.

$$u = g + h \quad (8d)$$

$$v = i + j \quad (8e)$$

$$w = k + l \quad (8f)$$

Test the overriding of automatic equation labels:

$$x = y + z \quad (\text{A-1})$$

$$= k + m \quad (\text{A-2})$$

Test the overriding of automatic equation labels, suppressing annotation:

$$x = y + z \quad \text{A-1}$$

$$= k + m \quad \text{A-2}$$

The labels in the first set of equations should be parenthesized, while the labels in the second set should not be parenthesized.

There is a significant difference between the standard L<sup>A</sup>T<sub>E</sub>X equation array and the AMS align environment. SW/SWP does not show this difference on screen. To check this difference, look at the Typeset Preview versions of the following.

$$\begin{array}{l} x = y \\ = z \end{array}$$

$$\begin{array}{l} x = y \\ = z \end{array}$$

The space around the = sign in the first set of equations (the L<sup>A</sup>T<sub>E</sub>X equation array) is much greater than in the second set (the AMS align environment). The spacing in the second set is preferred, as it agrees with the spacing in a single-line display:

$$x = y$$

To convert the L<sup>A</sup>T<sub>E</sub>X equation array to the AMS align environment, select the equations, then from the Edit menu, choose Properties. Select Advanced and then select Enable Alignment.

## 2 Mathematics in section heads $\int_{\alpha}^{\beta} \ln t dt$

You ought to be able to put mathematics in section heads. It might be a problem in style with running headers and table of contents entries.

### 2.1 Theorems, Lemmata, Etc.

You can automatically number theorems and other proclamations<sup>1</sup>. This is a marginal marginal note. These theorem-like environments are available.

**Acknowledgement 1** *This is an acknowledgement*

**Algorithm 2** *This is an algorithm*

**Axiom 3** *All mathematics is fun.*

**Case 4** *This is a case*

**Claim 5** *This is a claim*

**Conclusion 6** *This is a conclusion*

**Condition 7** *This is a condition*

**Conjecture 8** *Some people don't like mathematics.*

---

<sup>1</sup>Such as propositions, lemmas and corollaries. You can create your own theorem-like environments to extend the basic set provided with SW.

Footnotes, such as this, can have several paragraphs. Each paragraph can be as large as you want. You can include mathematics, graphics, or anything else you can enter in main-document paragraphs. It is even possible to compare the difference between an in-line sum  $\sum_{n=1}^{\infty} \frac{1}{n^2}$  and a displayed sum

$$\sum_{n=1}^{\infty} \frac{1}{n^2}$$

Marginal notes are like call-outs in graphics. You can bring the reader's attention to a point made in the text. Marginal notes can have multiple paragraphs.

**Corollary 9** *This is a corollary*

**Criterion 10** *This is a criterion*

**Definition 11** *This is a definition*

**Example 12** *This is an example*

**Exercise 13** *This is an exercise*

**Lemma 14** *The plural of lemma is lemmata, so they say. Why all these lemmas?*

**Proof.** This is the proof of the lemma.

**Notation 15** *This is notation*

**Problem 16** *This is a problem*

**Proposition 17** *This is a proposition*

**Remark 18** *This is a remark*

**Summary 19** *This is a summary*

**Theorem 20 (Main Theorem)** *Suppose  $u_0 \in C^3(\mathbf{R}^3)$ ,  $u_1 \in C^2(\mathbf{R}^3)$  have finite energy*

$$\int_{\mathbf{R}^3} \left( \frac{|u_1|^2 + |\nabla u_0|^2}{2} + \frac{|u_0|^6}{6} \right) dx < \infty \quad (9)$$

*and suppose the solution  $u^{(0)}$  to the homogeneous wave equation with initial data  $u_0, u_1$  is uniformly bounded. Then there exists  $\epsilon_0 > 0$  such that for  $|\epsilon| < \epsilon_0$  the initial value problem (1) with data  $\epsilon u_0, \epsilon u_1$  admits a global  $C^2$ -solution.*

**Proof.** This is the proof.

## 3 Section Heading

This is body text following a section heading.

### 3.1 Subsection Heading

This is body text following a subsection heading.

#### 3.1.1 Subsubsection Heading

This is body text following a subsubsection heading.

**Subsubsubsection Heading** This is body text following a subsubsubsection heading.

**Subsubsubsubsection Heading** This is body text following a subsubsubsubsection heading.

## 4 Another Section Heading

If this section is numbered, check that it is numbered correctly.

## 4.1 Another Subsection Heading

If this subsection heading is numbered, check that it is numbered correctly.

### 4.1.1 Another Subsubsection Heading

If this subsubsection heading is numbered, check that it is numbered correctly.

**Another Subsubsubsection Heading** If this subsubsubsection heading is numbered, check that it is numbered correctly.

**Another Subsubsubsubsection Heading** If this subsubsubsubsection heading is numbered, check that it is numbered correctly.

The sections above are sections 3, 3.1, 3.1.1, 3.1.1, 3.1.1, 4, 4.1, 4.1.1, 4.1.1, 4.1.1.

## Starred Sections

SW/SWP provides no direct user access to the `\section*` command. However, the input and output filters should preserve these constructs. Starred sections are not numbered and do not appear in the table of contents when a document is typeset. A better way to handle this is to set the section numbering counter depth.

### Starred Subsection

#### Starred Subsubsection

#### Starred Subsubsubsection

#### Starred Subsubsubsubsection

## 5 Sections with Optional Arguments

Optional arguments to sections are entered by putting them in square brackets at the start of the heading text. These optional arguments are used for the short form of a heading in running heads.

### 5.1 Subsection

#### 5.1.1 Subsubsection

#### Subsubsubsection

#### Subsubsubsubsection

### 5.2 Lists

#### 5.2.1 Numbered Lists

1. First numbered item, level 1.
  - (a) First numbered item, level 2.,
    - i. First numbered item, level 3.
      - A. First numbered item, level 4.
      - B. Second numbered item, level 4.
    - ii. Second numbered item, level 3.

- (b) Second numbered item, level 2.
- 2. Second numbered item, level 1.
  - (a) First numbered item, level 2.
    - i. First numbered item, level 3.
      - A. First numbered item, level 4.
      - B. Second numbered item, level 4.
    - ii. Second numbered item, level 3.
  - (b) Second numbered item, level 2.

The items above are numbered 1, 1a, 1(a)i, 1(a)iA, 1(a)iB, 1(a)ii, 1b, 2, 2a, 2(a)i, 2(a)iA, 2(a)iB, 2(a)ii, 2b in that order.

Here is a list with multiple levels on one line. There should be five lines, only. Items should not be split out on separate lines.

1. First item, normal.
2. (a) Second item, both numbers.
3. (a) i. Third item, three numbers.
4. (a) i. A. Fourth item, four numbers.
5. (a) i. A. Fifth item. Second, third, and fourth numbers.

Here is a list with continuation items.

1. Level 1, first paragraph.  
Level 1, second paragraph.
  - (a) Level 2, first paragraph.  
Level 2, second paragraph.
    - i. Level 3, first paragraph.  
Level 3, second paragraph.
      - A. Level 4, first paragraph.  
Level 4, second paragraph.

### 5.2.2 Bulleted Lists

- Bullet item, level 1.
  - Bullet item, level 2.
    - \* Bullet item, level 3.
      - Bullet item, level 4.

- Bullet item, level 1.

This is a continuation paragraph in a bullet item. The paragraph has been made long enough to wrap, and so wrap it will. The question is, do you like wrap? Is it your taste in music?

- Bullet item, level 2.

This is a continuation paragraph in a bullet item. The paragraph has been made long enough to wrap, and so wrap it will. The question is, do you like wrap?

- \* Bullet item, level 3.

This is a continuation paragraph in a bullet item. The paragraph has been made long enough to wrap, and so wrap it will. The question is, do you like wrap?

- Bullet item, level 4.

This is a continuation paragraph in a bullet item. The paragraph has been made long enough to wrap, and so wrap it will. The question is, do you like wrap?

### 5.2.3 Custom Lists

**gnat** A small animal, found in the North Woods, that causes no end of trouble.

**gnu** A large animal, found in crossword puzzles, that causes no end of trouble.

**armadillo** A medium-sized animal, named after a medium-sized Texas city. A medium-sized animal, named after a medium-sized Texas city.

**A very long custom label here** There should be enough text following to allow the paragraph to wrap to the next line.

Here is a continuation paragraph of the above custom item.

### 5.2.4 Lists with custom lead-ins.

#### Numbered lists with custom lead-ins.

Number 1: First numbered item

Number 2: Second numbered item

Number 3: Third numbered item

Number 3.a: First item under Number 3

Number 3.a.i: First item under Number 3.a:

Number 3.a.i.1: First item under Number 3.a.i:

Number 3.a.i.2: Second item under Number 3.a.i:

Continuation paragraph under the second item under Number 3.a.i:

#### Bulleted lists with custom lead-ins.

Bullet: First item

Bullet: Second item

Bullet: Third item

Square: First item under the third item

Triangle: First item under the first item under the third item

elgnairT: First item under the first item under the first item under the third item

elgnairT: Second item under the first item under the first item under the third item

Continuation paragraph under the second item under the first item under the third item

#### Lists with multiple lead-ins per line.

1. First

2. (a) Second, First

3. (a) i. Third, First, First

4. (a) i. A. Fourth, First, First, First

1. Reset to First

2. (a) Second, First

(b) i. None, Second, First

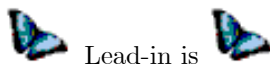
ii. A. None, None, Second, First

## Lists with complex custom items.

$\int \sin x dx$  Lead-in is  $\int \sin x dx$

ℳℬℯ Lead-in is ℳℬℯ

$\sqrt[3]{}$  If the leadin contains an item with an optional parameter, that item should be in a group to prevent the closing bracket of the optional argument from closing the item brackets.



Lead-in is

## Lists whose items contain notes

1. A footnote<sup>2</sup>
2. A margin note
  - (a) A footnote with lists. <sup>3</sup>
  - (b) A margin note with lists.

This marginal note is in a list item  
A list in a margin note:

- i. First item
- ii. Second item
  - A. First item
  - B. Second item

## 5.3 Block Quote and Centered

In addition to Body Text, there are paragraph tags named Block Quote and Center. Here is a Block Quote paragraph.

Why, there, there, there, there! A diamond gone, cost me two thousand ducats in Frankfort! The curse never fell upon our nation till now; I never felt it till now. Two thousand ducats in that, and other precious, precious jewels. I would my daughter were dead at my foot, and the jewels in her ear! Would she were hearsed at my foot, and the jewels in her coffin! No news of them? Why, thou loss upon loss! The thief gone with so much, and so much to find the thief, and no satisfaction, no revenge! Nor no ill luck stirring but what lights o' my shedding.

Here is a centered paragraph:

Nay, that's true, that's very true. Go, Tubal, fee me an officer; bespeak him a fortnight before. I will have the heart of him if he forfeit, for were he out of Venice I can make what merchandise I will. Go, Tubal, and meet me at our synagogue; go, good Tubal; at our synagogue, Tubal.

## 5.4 Footnotes and Marginal Notes

In this section, we insert multiple footnotes and multiple marginal notes. This illustrates the various parameters used to separate multiple footnotes and marginal paragraphs.<sup>4567</sup>

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<sup>2</sup>This footnote is in a list item

<sup>3</sup>A list in a footnote:

- i. First item
- ii. Second item
  - A. First item
  - B. Second item

<sup>4</sup>The first in a series of consecutive footnotes.

<sup>5</sup>The second in a series of consecutive footnotes.

<sup>6</sup>The third in a series of consecutive footnotes.

<sup>7</sup>The fourth in a series of consecutive footnotes.

The first in a series of marginal notes.  
The second in a series of marginal notes.  
The third in a series of marginal notes.  
The fourth in a series of marginal notes.

## 6 Cross-References and Their Ilk

The section on theorems is numbered 2.1 and is on page 5. The current section (on cross-references and their ilk) is numbered 6 and is on page 11.

## 7 Text Tags

Text tags are the tags you apply to text within a paragraph, to distinguish phrases. There are tags for physical phrase markup and tags for logical phrase markup.

This section discusses the differences between some aspects of the  $\LaTeX$  coding *SW* uses in  $\LaTeX$ 2.09 and  $\LaTeX$ 2e documents. In  $\LaTeX$ 2.09, the commands for what we call *tagged runs*, including boldface, italics, and emphasis, are switches. In  $\LaTeX$ 2e, the switch commands are still available, but use of the new macro forms is strongly encouraged. We at TCI agree with this wholeheartedly—switches are an abomination and have caused us no end of trouble in the past. The new macro forms of the tagged runs also have additional capabilities, most of which are supported in *SW*.

### 7.1 Tagged Runs in Text

Here is a comparison of the tagged runs in text.

| Name       | $\LaTeX$ 2.09         | $\LaTeX$ 2e                | Example     |
|------------|-----------------------|----------------------------|-------------|
| Italic     | <code>\it text</code> | <code>\textit{text}</code> | <i>text</i> |
| Bold       | <code>\bf text</code> | <code>\textbf{text}</code> | <b>text</b> |
| Small Caps | <code>\sc text</code> | <code>\textsc{text}</code> | TEXT        |
| Sans Serif | <code>\sf text</code> | <code>\textsf{text}</code> | text        |
| Slant      | <code>\sl text</code> | <code>\textsl{text}</code> | <i>text</i> |
| Typewriter | <code>\tt text</code> | <code>\texttt{text}</code> | text        |
| Emphasis   | <code>\em text</code> | <code>\em text</code>      | <i>text</i> |
| Roman      | <code>\rm text</code> | <code>\textrm{text}</code> | text        |

### 7.2 Tagged Runs in Mathematics

All of the text tagged runs are also valid in mathematics. Since *SW* works very hard to provide a minimal nesting level of tags, these must be shown in an environment that forces math. Within that environment (here, a pair of empty expanding brackets), we select text in addition to the tagged run.

| Name       | $\LaTeX$ 2.09                | $\LaTeX$ 2e                | Example     |
|------------|------------------------------|----------------------------|-------------|
| Italic     | <code>\text{\it text}</code> | <code>\textit{text}</code> | <i>text</i> |
| Bold       | <code>\text{\bf text}</code> | <code>\textbf{text}</code> | <b>text</b> |
| Small Caps | <code>\text{\sc text}</code> | <code>\textsc{text}</code> | TEXT        |
| Sans Serif | <code>\text{\sf text}</code> | <code>\textsf{text}</code> | text        |
| Slant      | <code>\text{\sl text}</code> | <code>\textsl{text}</code> | <i>text</i> |
| Typewriter | <code>\text{\tt text}</code> | <code>\texttt{text}</code> | text        |
| Emphasis   | <code>\text{\em text}</code> | <code>\em text</code>      | <i>text</i> |
| Roman      | <code>\text{\rm text}</code> | <code>\textrm{text}</code> | text        |

The coding of the above tagged runs presents a number of problems for the filter. There is now an option to use `\textrm` or `\mbox` in place of the `\text` command.

| Name       | $\LaTeX$ 2.09         | $\LaTeX$ 2e                | Example     |
|------------|-----------------------|----------------------------|-------------|
| Italic     | <code>\it text</code> | <code>\textit{text}</code> | <i>text</i> |
| Bold       | <code>\bf text</code> | <code>\textbf{text}</code> | <b>text</b> |
| Small Caps | <code>\sc text</code> | <code>\textsc{text}</code> | <i>text</i> |
| Sans Serif | <code>\sf text</code> | <code>\textsf{text}</code> | <b>text</b> |
| Slant      | <code>\sl text</code> | <code>\textsl{text}</code> | <i>text</i> |
| Typewriter | <code>\tt text</code> | <code>\texttt{text}</code> | <b>text</b> |
| Emphasis   | NA                    | NA                         | NA          |
| Roman      | <code>\rm text</code> | <code>\textrm{text}</code> | text        |

SMALL CAPS HERE!

*This sentence is slanted.*

This is math  $[x + \textit{italic} + y + \text{sansserif} + \textbf{bold} + \text{roman} + \textit{CALLIGRAPHIC}]$

Here is a display

$$x + \text{text} + y + \text{roman} + \text{roman text}$$

and then we finish off the paragraph with great alacrity.

*Now we use italics. Here is a display*

$$x + \text{text} + y + \text{roman} + \text{roman text}$$

*and then we finish off the paragraph with great alacrity.*

*This is a paragraph of italic text with a stretch of roman in the middle.*

You obtain `\mathrm` by applying `roman` to a selection in math, and you obtain `\textrm` by applying `text` and then applying `roman`.  $[x + \text{roman} + \text{textroman}]$

### 7.3 Fraktur and Blackboard Bold

`fraktur`

`BLACKBOARDBOLD`

## 8 The `\text` Command

*SW* writes text in mathematics using the AMS `\text` command. This is the only command for text in mathematics that reduces size appropriately when smaller fonts are called for in  $\LaTeX$ 2.09. The `\rm` switch also works in  $\LaTeX$ 2e. Here is text in mathematics at various sizes:

$$X^{x+\text{text}^{x+\text{text}}} + \text{text}$$

and the same, attempted with `\rm`:

$$X^{x+\text{text}^{x+\text{text}}} + \text{text}$$

and with `\mbox`:

$$X^{x+\text{text}^{x+\text{text}}} + \text{text}$$

### 8.1 Operators

The following is a list of operators from the INSERT, OPERATOR... menu selection.

|           |          |           |          |                    |         |          |           |          |
|-----------|----------|-----------|----------|--------------------|---------|----------|-----------|----------|
| $\int$    | $\iint$  | $\iiint$  | $\iiiii$ | $\int \cdots \int$ | $\oint$ | $\Sigma$ | $\Pi$     | $\cap$   |
| $\Lambda$ | $\oplus$ | $\ominus$ | $\sqcup$ | $\amalg$           | $\cup$  | $\vee$   | $\otimes$ | $\uplus$ |

The following is a list of operators from the INSERT, OPERATOR... menu selection. In this example, all operators are set to “Big,” while all limit positions are set “at right.”

|                   |                       |                                 |   |   |
|-------------------|-----------------------|---------------------------------|---|---|
| $\int_b^a$        | $\iint_A^b$           | $\iiint_{\Delta} dV$            | $\iiint\int_{?} dT$   | $\int \dots \int d \dots$                 |
| $\bigwedge_i x_i$ | $\bigoplus^{100} X_i$ | $\odot_{\nu \neq v} \Psi_{\nu}$ | $\sqcup_{\xi = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}} \xi$ | $\prod^{A \text{ small paragraph}} \Xi_i$ |

|                          |                              |   |                                |
|--------------------------|------------------------------|---|--------------------------------|
| $\oint_{\Gamma} d\gamma$ | $\sum_{x=1}^5 \frac{1}{x^2}$ | $\prod_{x=5}^7 (1 - \sqrt{x})$          | $\bigcap_{A \in \mathbf{A}} A$ |
| $\bigcup_{x^{x^x}} U_x$  | $\bigvee_{\int i} y^i$       | $\otimes_{\mu \in \{1,2,5,7\}} \Phi\mu$ | $\uplus_{Blow}^{Joe} B$        |

The following is a list of operators from the INSERT, OPERATOR... menu selection. In this example, all operators are set to “Small,” while all limit positions are set “at right.”

|                   |                            |                                 |   |   |
|-------------------|----------------------------|---------------------------------|---|---|
| $\int_b^a x dx$   | $\iint_A \frac{dx dy}{xy}$ | $\iiint_{\Delta} dV$            | $\iiint\int_{?} dT$   | $\int \dots \int \dots d \dots$           |
| $\bigwedge_i x_i$ | $\bigoplus^{100} X_i$      | $\odot_{\nu \neq v} \Psi_{\nu}$ | $\sqcup_{\xi = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}} \xi$ | $\prod^{A \text{ small paragraph}} \Xi_i$ |

|                          |                              |   |                                |
|--------------------------|------------------------------|---|--------------------------------|
| $\oint_{\Gamma} d\gamma$ | $\sum_{x=1}^5 \frac{1}{x^2}$ | $\prod_{x=5}^7 (1 - \sqrt{x})$          | $\bigcap_{A \in \mathbf{A}} A$ |
| $\bigcup_{x^{x^x}} U_x$  | $\bigvee_{\int i} y^i$       | $\otimes_{\mu \in \{1,2,5,7\}} \Phi\mu$ | $\uplus_{Blow}^{Joe} B$        |

The following is a list of operators from the INSERT, OPERATOR... menu selection. In this example, all operators are set to “Big,” while all limit positions are set “Above/below.”

|                   |                            |                                 |   |   |
|-------------------|----------------------------|---------------------------------|---|---|
| $\int_b^a x dx$   | $\iint_A \frac{dx dy}{xy}$ | $\iiint_{\Delta} dV$            | $\iiint\int_{?} dT$   | $\int \dots \int d \dots$                 |
| $\bigwedge_i x_i$ | $\bigoplus^{100} X_i$      | $\odot_{\nu \neq v} \Psi_{\nu}$ | $\sqcup_{\xi = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}} \xi$ | $\prod^{A \text{ small paragraph}} \Xi_i$ |

|                          |                              |   |                                |
|--------------------------|------------------------------|---|--------------------------------|
| $\oint_{\Gamma} d\gamma$ | $\sum_{x=1}^5 \frac{1}{x^2}$ | $\prod_{x=5}^7 (1 - \sqrt{x})$          | $\bigcap_{A \in \mathbf{A}} A$ |
| $\bigcup_{x^{x^x}} U_x$  | $\bigvee_{\int i} y^i$       | $\otimes_{\mu \in \{1,2,5,7\}} \Phi\mu$ | $\uplus_{Blow}^{Joe} B$        |

### 8.1.1 Multi-Line Subscripts and Superscripts

$\sum_{\substack{1 < i < 10 \\ 1 < j < 10}} 2^{i+j}$  is more reasonable than  $\Gamma_{1_2_3}^{1_2_3}$

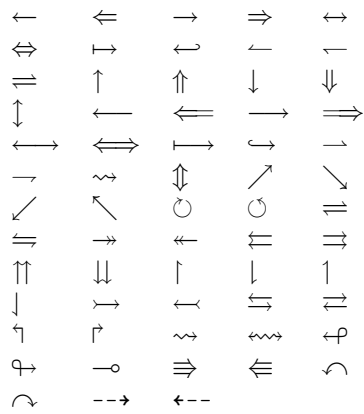
### 8.2 Brackets

The following is a list of the different brackets from the INSERT, BRACKETS... menu selection.

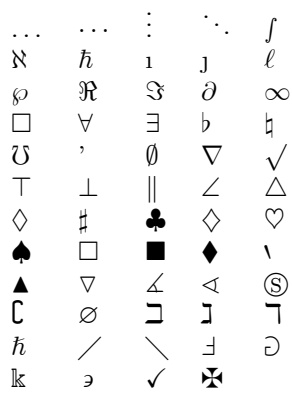




### 8.5.6 Arrows



### 8.5.7 Miscellaneous



### 8.5.8 Delimiters



### 8.5.9 ASCII

|    |   |   |   |   |   |
|----|---|---|---|---|---|
|    | 0 | @ | P | ' | p |
| !  | 1 | A | Q | a | q |
| "  | 2 | B | R | b | r |
| #  | 3 | C | S | c | s |
| \$ | 4 | D | T | d | t |
| %  | 5 | E | U | e | u |
| &  | 6 | F | V | f | v |
| '  | 7 | G | W | g | w |
| (  | 8 | H | X | h | x |
| )  | 9 | I | Y | i | y |
| *  | : | J | Z | j | z |
| +  | ; | K | [ | k | { |
| ,  | < | L | \ | l |   |
| -  | = | M | ] | m | } |
| .  | > | N | ^ | n | ~ |
| /  | ? | O | _ | o |   |

TeX converts the following pairs and triples to single characters called ligatures  
ff fi fl ffi ffl

Kerning is the subtle adjustment of certain pairs of characters.

**To, Wo, Ro**

## 9 Type Styles and Kerns

The text in this section tests the available L<sup>A</sup>T<sub>E</sub>X type styles (plain, bold, italic, and bold italic) for each of the basic fonts (Roman-Times, Sans Serif-Arial, and Typewriter-Courier). We also check small caps and the available kerns.

### 9.1 Type Styles for Roman, Sans Serif, and Typewriter

Roman **bold**, *italic*, and **bold italic**.

Sans Serif **bold**, *italic*, and **bold italic**.

Typewriter **bold**, *italic*, and **bold italic**.

tiny roman **bold**, *italic*, and **bold italic**

tiny Sans Serif **bold**, *italic*, and **bold italic**

tiny Typewriter **bold**, *italic*, and **bold italic**

scriptsize roman **bold**, *italic*, and **bold italic**

scriptsize Sans Serif **bold**, *italic*, and **bold italic**

scriptsize Typewriter **bold**, *italic*, and **bold italic**

footnotesize roman **bold**, *italic*, and **bold italic**

footnotesize Sans Serif **bold**, *italic*, and **bold italic**

footnotesize Typewriter **bold**, *italic*, and **bold italic**

small roman **bold**, *italic*, and **bold italic**

small Sans Serif **bold**, *italic*, and **bold italic**

small Typewriter **bold**, *italic*, and **bold italic**

normalsize roman **bold**, *italic*, and **bold italic**

normalsize Sans Serif **bold**, *italic*, and **bold italic**

normalsize Typewriter **bold**, *italic*, and **bold italic**

large roman **bold**, *italic*, and **bold italic**

large Sans Serif **bold**, *italic*, and **bold italic**

large Typewriter **bold**, *italic*, and **bold italic**

Large roman **bold**, *italic*, and **bold italic**

Large Sans Serif **bold**, *italic*, and **bold italic**  
 Large Typewriter bold, *italic*, and *bold italic*  
 LARGE roman **bold**, *italic*, and *bold italic*  
 LARGE Sans Serif **bold**, *italic*, and **bold italic**  
 LARGE Typewriter bold, *italic*, and *bold italic*  
 huge roman **bold**, *italic*, and *bold italic*  
 huge Sans Serif **bold**, *italic*, and **bold italic**  
 huge Typewriter bold, *italic*, and *bold italic*  
 Huge roman **bold**, *italic*, and *bold italic*  
 Huge Sans Serif **bold**, *italic*, and **bold italic**  
 Huge Typewriter bold, *italic*, and *bold italic*  
*bold italic*

### 9.1.1 Bold Greek Letters

Here are uppercase and lowercase greek letters, normal and bold, together with nabla, in a variety of positions:

$$x + \gamma + \alpha + \Gamma(\lambda)\Psi^{\beta\delta} + \nabla(\kappa\nu\mu) + \nabla$$

Here is a more comprehensive listing:

$\alpha^{\alpha\alpha}$   $\alpha^{\alpha\alpha}$     $\beta^{\beta\beta}$   $\beta^{\beta\beta}$     $\gamma^{\gamma\gamma}$   $\gamma^{\gamma\gamma}$     $\delta^{\delta\delta}$   $\delta^{\delta\delta}$     $\epsilon^{\epsilon\epsilon}$   $\epsilon^{\epsilon\epsilon}$     $\varepsilon^{\varepsilon\varepsilon}$   $\varepsilon^{\varepsilon\varepsilon}$     $\zeta^{\zeta\zeta}$   $\zeta^{\zeta\zeta}$   
 $\eta^{\eta\eta}$   $\eta^{\eta\eta}$     $\theta^{\theta\theta}$   $\theta^{\theta\theta}$     $\vartheta^{\vartheta\vartheta}$   $\vartheta^{\vartheta\vartheta}$     $\iota^{\iota\iota}$   $\iota^{\iota\iota}$     $\kappa^{\kappa\kappa}$   $\kappa^{\kappa\kappa}$     $\lambda^{\lambda\lambda}$   $\lambda^{\lambda\lambda}$     $\mu^{\mu\mu}$   $\mu^{\mu\mu}$

Here are superscript greek letters, normal and bold, following normal and bold numbers:

$1^{\alpha\alpha}$   $1^{\alpha\alpha}$     $1^{\beta\beta}$   $1^{\beta\beta}$     $1^{\gamma\gamma}$   $1^{\gamma\gamma}$     $1^{\delta\delta}$   $1^{\delta\delta}$     $1^{\epsilon\epsilon}$   $1^{\epsilon\epsilon}$     $1^{\varepsilon\varepsilon}$   $1^{\varepsilon\varepsilon}$     $1^{\zeta\zeta}$   $1^{\zeta\zeta}$   
 $1^{\eta\eta}$   $1^{\eta\eta}$     $1^{\theta\theta}$   $1^{\theta\theta}$     $1^{\vartheta\vartheta}$   $1^{\vartheta\vartheta}$     $1^{\iota\iota}$   $1^{\iota\iota}$     $1^{\kappa\kappa}$   $1^{\kappa\kappa}$     $1^{\lambda\lambda}$   $1^{\lambda\lambda}$     $1^{\mu\mu}$   $1^{\mu\mu}$

Here are subscript greek letters, normal and bold, following normal and bold numbers:

$1_{\alpha\alpha}$   $1_{\alpha\alpha}$     $1_{\beta\beta}$   $1_{\beta\beta}$     $1_{\gamma\gamma}$   $1_{\gamma\gamma}$     $1_{\delta\delta}$   $1_{\delta\delta}$     $1_{\epsilon\epsilon}$   $1_{\epsilon\epsilon}$     $1_{\varepsilon\varepsilon}$   $1_{\varepsilon\varepsilon}$     $1_{\zeta\zeta}$   $1_{\zeta\zeta}$   
 $1_{\eta\eta}$   $1_{\eta\eta}$     $1_{\theta\theta}$   $1_{\theta\theta}$     $1_{\vartheta\vartheta}$   $1_{\vartheta\vartheta}$     $1_{\iota\iota}$   $1_{\iota\iota}$     $1_{\kappa\kappa}$   $1_{\kappa\kappa}$     $1_{\lambda\lambda}$   $1_{\lambda\lambda}$     $1_{\mu\mu}$   $1_{\mu\mu}$

## 10 Font Size Commands

The L<sup>A</sup>T<sub>E</sub>X font size switches are not directly supported by SW. This is deliberate, because we attempt to create objects that encapsulate such switches. A switch “in the clear” causes the filter to turn that switch on and off for every paragraph. Thus, all such switches should be encapsulated like this:  $\{\backslashhuge huge\text{ text}\}$ . We strongly discourage the use of such switches. Instead, you should create appropriate tags in a style, giving the size changes content-oriented meaning. The following table is included here to check the font sizes and shapes provided by the style.

| <b>L<sup>A</sup>T<sub>E</sub>X Command</b> | <b>Style Editor Size</b> | <b>Example</b> |
|--|--------------------------|----------------|
| <code>\tiny</code>                         | tiny                     | Gnu            |
| <code>\scriptsize</code>                   | script                   | Gnu            |
| <code>\footnotesize</code>                 | footnote                 | Gnu            |
| <code>\small</code>                        | small                    | Gnu            |
| <code>\normal</code>                       | normal                   | Gnu            |
| <code>\large</code>                        | large-1                  | Gnu            |
| <code>\Large</code>                        | large-2                  | Gnu            |
| <code>\LARGE</code>                        | large-3                  | Gnu            |
| <code>\huge</code>                         | large-4                  | Gnu            |
| <code>\Huge</code>                         | large-5                  | Gnu            |

## 11 Spacing Objects

### 11.1 Horizontal

Each horizontal spacing object is placed between reversed brackets, where this makes sense.

|   |  |  |
|---|--|--|
| Required space ] [                      |  |  |
| Non-breaking space ] [                  |  |  |
| Em space (quad) ] [                     |  |  |
| 2-Em space (double quad) ] [            |  |  |
| Thin space ] [                          |  |  |
| Thick space ] [                         |  |  |
| Italic correction ] [                   |  |  |
| Negative thin space ] [                 |  |  |
| Zero space ] [                          |  |  |
| No indent                               |  |  |
| Custom space (1 inch) ] [               |  |  |
| Custom space (stretchy, 1.0) ] [        |  |  |
| Custom spaces (stretchy, 1.0, 0.5) ] [  |  |  |
| Custom space (stretchy, line) ] _____ [ |  |  |
| Custom space (stretchy, dots) ] ..... [ |  |  |

### 11.2 Vertical

Small skip:

Medium skip:

Big skip:

Strut ] [

Math strut  $\sqrt{\quad}$  Radical without math strut  $\sqrt{\quad}$

Custom (1 inch):

### 11.3 Rule



Rule, raised 0.25 inch, 1 inch wide, .25 inch high

### 11.4 Breaks

Allowbreak ][  
Discretionary hyphen ][  
No break ][  
Page break][

New page ]

```
[
Line                                     break                                     ]
[
New line ]
[
Custom new line, 1 inch]
```

[

## 12 Verb and Verbatim

The L<sup>A</sup>T<sub>E</sub>X `\verb` command is available as a fragment. You enter the fragment, then choose Edit Properties to change the contents. A `\verb: ‘~!@#$$%^&*()_+|\{}`

The L<sup>A</sup>T<sub>E</sub>X verbatim environment is translated to the Body Verbatim paragraph environment in *Scientific Word*. This environment is valuable for displaying fragments of program code:

```
\long\def\@caption#1[#2]#3{%
\par
%\edef\@tempa{\csname #1TOCLabel\endcsname}
\AddContentsLine
{\csname ext@#1\endcsname}%
{#1@toc}%
{\csname #1toclabel\endcsname}%
{\ignorespaces #2}%
\begingroup
\@parboxrestore
\normalsize
\csname @makecaption#1\endcsname{\ignorespaces #3}\par
\endgroup}
```

Active L<sup>A</sup>T<sub>E</sub>X characters can cause problems in verbatim translations:

```
‘~!@#$$%^&*()_+=[\|};:’",<.>/?
```

Another approach to program code is illustrated by the following, which uses a table.

```
for j := 2 step 1 until n do
  begin accum := A[j]; k := j - 1; A[0] := accum;
  while A[k] > accum do
    begin A[k + 1] := A[k]; k := k - 1;
    end;
  A[k + 1] := accum;
end.
```

## 13 Comments

You enter L<sup>A</sup>T<sub>E</sub>X comments using the comment fragment. Enter the fragment, then choose Edit Properties to change the body of the comment.

## 14 Tables and Arrays

### 14.1 Tables

There are many different tables that you can create with the table editor. Some are included here to test

| Ethnicity    | 1986   | 1987   | 1988   | 1989   | 1990   | % Change<br>1986-1990 |
|--------------|--------|--------|--------|--------|--------|-----------------------|
| Amer. Indian | 294    | 277    | 298    | 328    | 361    | 23.0%                 |
| Black        | 192    | 206    | 199    | 183    | 225    | 17.0%                 |
| Hispanic     | 3,108  | 3,131  | 3,433  | 3,637  | 4,038  | 30.0%                 |
| Oriental     | 67     | 65     | 71     | 77     | 96     | 30.0%                 |
| Other        | 10,057 | 10,324 | 10,283 | 10,075 | 10,089 | 0.3%                  |

| Course   | 1987 | 1988 | 1989 | 1990 | 1991 |
|----------|------|------|------|------|------|
| MATH 280 | 68   | 61   | 58   | 61   | 84   |
| MATH 480 | 36   | 26   | 41   | 44   | 53   |

#### 14.1.1 From the L<sup>A</sup>T<sub>E</sub>X User's Guide and Reference Manual

|           |         |         |
|-----------|---------|---------|
| gnats     | gram    | \$13.65 |
|           | each    | .01     |
| gnu       | stuffed | 92.50   |
| emur      |         | 33.33   |
| armadillo | frozen  | 8.99    |

| <i>type</i>  | <i>style</i> |       |
|--------------|--------------|-------|
| smart        | red          | short |
| rather silly | puce         | tall  |

#### 14.1.2 From Jane Hahn's L<sup>A</sup>T<sub>E</sub>X for Everyone

| Overall Heading of Table |                 |          |                 |
|--------------------------|-----------------|----------|-----------------|
| Left-justified           | Right-justified | Centered | Right-justified |
| one                      | two             | three    | four            |
| 1                        | 2               | 3        | 4               |
| i                        | ii              | iii      | iv              |

| Household Budget |             |
|------------------|-------------|
| Item             | % of Budget |
| Housing          | 50.0        |
| Food             | 25.0        |
| Toys             | 10.5        |
| Pet Supplies     | 7.5         |
| Clothes          | 5.25        |
| Charity          | 1.75        |

| PORTABLE HOOK-ON CHAIRS |               |              |
|-------------------------|---------------|--------------|
| BRAND                   | Graco         | Strolee      |
| MODEL                   | Tot Loc Chair | Meal Mate    |
| PRICE                   | \$23          | \$32         |
| OVERALL JUDGEMENT       | Satisfactory  | Satisfactory |
| WEIGHT                  | 7 lb. 9 oz.   | 6 lb. 8 oz.  |

| THE CATECHISM |  |
|---------------|--|
| Q.            | What are we by nature?   |
| A.            | We are part of God's creation, made in the image of God.   |
| Q.            | What does it mean to be created in the image of God?   |
| A.            | It means that we are free to make choices: to love; to create, to reason, and to live in harmony with creation and with God. |
| Q.            | Why then do we live apart from God and out of harmony with creation?   |
| A.            | From the beginning, human beings have misused their freedom and made wrong choices.  |

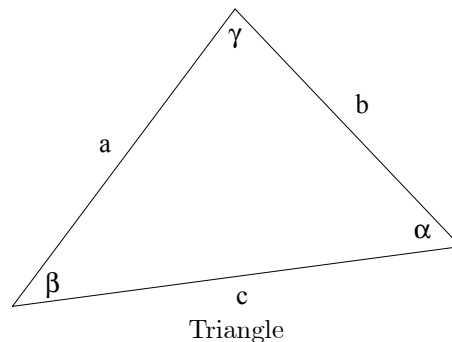
### 14.1.3 The Economist

Here is a table that is too wide for the page:

|               | Feb 22nd | 1993/94  |          | % change on |          |             |                                 |                  |
|---------------|----------|----------|----------|-------------|----------|-------------|---------------------------------|------------------|
|               |          | high     | low      | one week    | one year | record high | Dec 31st 1992 in local currency | 1992 in \$ terms |
| Australia     | 2,202.5  | 2,340.6  | 1,495.0  | - 1.4       | + 36.9   | - 5.9       | +42.1                           | +48.6            |
| Austria       | 450.7    | 460.7    | 300.3    | + 0.1       | + 29.8   | -35.9       | +44.0                           | +35.0            |
| Belgium       | 1,504.5  | 1,542.7  | 1,125.5  | - 1.2       | + 24.3   | - 2.5       | +33.5                           | +24.8            |
| Britain       | 3,333.7  | 3,520.3  | 2,737.6  | - 1.8       | + 18.3   | - 5.3       | +17.1                           | +14.4            |
| Canada        | 4,371.1  | 4,591.3  | 3,275.8  | - 1.0       | + 26.6   | - 4.8       | +30.5                           | +23.5            |
| Denmark       | 407.4    | 415.8    | 261.9    | + 0.3       | + 44.4   | - 2.0       | +55.7                           | +45.0            |
| France *      | 1,506.6  | 1,585.2  | 1,114.2  | - 1.0       | + 23.1   | - 5.0       | +32.1                           | +24.4            |
| Germany       | 2,107.6  | 2,268.0  | 1,516.5  | - 0.4       | + 26.8   | - 7.1       | +36.4                           | +27.9            |
| Holland       | 285.6    | 294.8    | 198.6    | - 1.4       | + 35.7   | - 3.1       | +44.2                           | +35.4            |
| Italy         | 672.2    | 689.0    | 446.3    | - 0.6       | + 33.7   | -26.0       | +50.6                           | +32.0            |
| Japan         | 19,342.6 | 21,148.1 | 16,078.7 | + 1.9       | + 14.7   | -50.3       | +14.3                           | +35.3            |
| Spain         | 339.6    | 358.3    | 215.6    | - 2.0       | + 49.0   | - 5.2       | +58.5                           | +29.2            |
| Sweden        | 1,565.8  | 1,603.9  | 879.1    | + 2.1       | + 58.5   | - 2.4       | +71.6                           | +53.0            |
| Switzerland   | 2,982.8  | 3,178.4  | 2,049.5  | - 0.3       | + 45.5   | - 6.2       | +41.6                           | +43.1            |
| United States | 3,911.7  | 3,978.4  | 3,242.0  | - 0.4       | + 17.7   | - 1.7       | +18.5                           | +18.5            |
| World †       | 621.2    | 641.0    | 488.6    | - 0.7       | + 23.1   | - 3.1       | +25.0                           | +25.0            |

## 15 Graphics

Here is a displayed graphic.



Displayed graphic.



Figure 1: This is the first caption text. It's below. It also contains a marker









Figure 2: This is the second caption text. It's below. It also contains a marker



In-line graphic in a centered paragraph.



Various inline graphics. On baseline , raised , lowered , with caption , Butterfly

without frame , frame only , iconified , using the default .

Different graphic types:

WMF :  $\alpha \beta \gamma \delta$

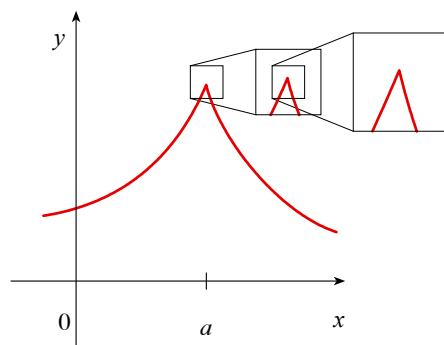
GIF:



JPEG:



AI:



Here is a floating graphic.

Reference to Fig:(1) and to Fig:(2)

Here is a floating graphic with very long keys.

References to Figures:(3) and (4)



Figure 3: This is the third caption text. It is a long caption so that we can observe line wrap in this case of a long long long caption longer than the line width.



Figure 4: This is the fourth caption containing mathematics.  $\int_{\alpha}^{\beta} \ln u du$

## 16 Standard $\text{\LaTeX}$ Float Environments

The standard  $\text{\LaTeX}$  float environments are figure and table. These are not directly supported by the SW/SWP input and output filters. However, these environments are preserved, and you can edit their contents using Edit Properties. All label statements are also visible in SW/SWP for cross-references.

Figure 5: Caption First

|                     |
|---------------------|
| ... figure body ... |
| ... figure body ... |

Figure 6: Caption Second

## 17 Scientific Notebook Items

These constructs were introduced with the first version of Scientific Notebook. They are now available in SW/SWP. They are provided here to test the ability of SW/SWP to create a document containing these constructs that can also be compiled with  $\text{\LaTeX}$ .

### 17.1 Hypertext Links

Hypertext link with text: [Left text]()[Right text]

Hypertext link with icon: [Left text]()[Right text]

Hypertext link with graphic: [Left text]()[Right text]

### 17.2 External Program Calls

External program call to the Solitaire program with text:

External program call to the Solitaire program with icon:

External program call to the Solitaire program with graphic:

Formula:  $\frac{1}{3}x^3$

Table 1: Caption First

|                    |
|--------------------|
| ... table body ... |
| ... table body ... |

Table 2: Caption Second

## 17.3 Units

### Base SI Units

| <i>Physical quantity</i>  | <i>Symbol</i> |
|---------------------------|---------------|
| length                    | m             |
| mass                      | kg            |
| time                      | s             |
| electric current          | A             |
| thermodynamic temperature | K             |
| amount of substance       | mol           |
| luminous intensity        | cd            |

### Supplementary SI Units

| <i>Physical quantity</i> | <i>Name</i> | <i>Symbol</i> |
|--------------------------|-------------|---------------|
| plane angle              | radian      | rad           |
| solid angle              | steradian   | sr            |

### Derived SI Units with Special Names

| <i>Physical quantity</i>      | <i>Symbol</i> |
|-------------------------------|---------------|
| frequency                     | Hz            |
| energy                        | J             |
| force                         | N             |
| power                         | W             |
| pressure                      | Pa            |
| electric charge               | C             |
| electric potential difference | V             |
| electric resistance           | $\Omega$      |
| electric conductance          | S             |
| electric capacitance          | F             |
| magnetic flux                 | Wb            |
| inductance                    | H             |
| magnetic flux density         | T             |
| luminous flux                 | lm            |
| illumination                  | lx            |

The following examples use Unicode characters.

MicroFarad:  $\mu\text{F}$

Degree Celcius:  $^{\circ}\text{C}$

Angular Measure:  $30^{\circ} 10' 12''$

Ohm:  $\Omega$

## 17.4 New Note Types

Margin Hint with icon:

Margin Hint with text:

Margin Hint with picture:

Solution Note with icon:

Solution Note with text:

Margin Hint

Margin Hint

Margin Hint

Solution

Note

Solution

Note

Solution Note with picture:  
 Problem Solving Hint with icon:  
 Problem Solving Hint with text:  
 Problem Solving Hint with picture:  
 Note with icon:  
 Note with text:  
 Note with picture:  
 Answer Note with icon: .  
 Answer Note with text: .  
 Answer Note with picture: .  
 Here is a note containing a picture: .  
 The following references automatically generate a References section heading.

Solution  
 Note  
 Problem  
 Solving Hint  
 Problem  
 Solving Hint  
 Problem  
 Solving Hint  
 Note  
 Note  
 Note  
 Answer Note  
 Answer Note  
 Answer Note  
 This an-  
 swer note  
 contains a  
 picture:



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