Now days many people begin to start using from \LaTeX when they want to use about \TeX. But, If it is true I’ve always been think that must have begin to start from \TeX(plain-\TeX).

Because, \LaTeX is a very very great macro of \TeX. So, I say, and thinking.

For persons that want to learn about \TeX, therefore, this document put here. I make extracts from “\TeX for the Impatient”, and from “3 Examples” in it. Also, They’ll really expected to do with yourself typesetting these source coding.

******************************

refer: \TeX for the Impatient(book.pdf)

....../CTAN/info/impatient/book.pdf

Example 1;  *Entering simple text*

It’s easy to prepare ordinary text for TeX since TeX usually doesn’t care about how you break up your input into lines. It treat the end of a line of text like a space.† If you don’t want a space there, put a percent sign (the comment character) at the end of the line. TeX ignores spaces at the start of a line, and treats more than one space as equivalent to a single space, even after a period. you indicate a new paragraph by skipping a line (or more than one line).

When TeX sees a period followed by a space (or the end of the line, which is equivalent), it ordinarily assumes you’ve ended a sentence and inserts a little extra space after the period. It treats question marks and exclamation points the same way.

But TeX’s sees rules for handling periods sometimes need fine tuning. TeX assumes that a capital letter before a period doesn’t end the sentence, so you have to do something a little different if, say, you’re writing about DNA. It’s a good idea to tie words together in references such as “see Fig. 8” and in names such as V. I Lenin and in . . . so that TeX will never split them in an awkward place between two lines. (The three dots indicate an ellipsis.)

You should put quotations in pairs of left and right single “quote” so that you get the correct left and right double quotation marks. “For adjacent single and double quotation marks, insert a ‘thinspace’”. You can get en-dashes—like so, and em-dashes—like so.

† TeX treat a table like a space too, as we point out in this *footnote*.  

page 22
It's easy to prepare ordinary text for \TeX{} since \TeX{} usually doesn't care about how you break up your input into lines. It treats the end of a line of text like a space. If you don't want a space there, put a percent sign (the comment character) at the end of the line. \TeX{} ignores spaces at the start of a line, and treats more than one space as equivalent to a single space, even after a period. You indicate a new paragraph by skipping a line (or more than one line).

When \TeX{} sees a period followed by a space (or the end of the line, which is equivalent), it ordinarily assumes you've ended a sentence and inserts a little extra space after the period. It treats question marks and exclamation points the same way. But \TeX{}'s sees rules for handling periods sometimes need fine tuning. \TeX{} assumes that a capital letter before a period doesn't end the sentence, so you have to do something a little different if, say, you're writing about DNA\null. The \null prevents TeX from perceiving the capital 'A' as being next to the period.

It's a good idea to tie words together in references such as 'see Fig. ~8' and in names such as V.~I Lenin and in $\ldots$ so that \TeX{} will never split them in an awkward place between two lines. (The three dots indicate an ellipsis.)

You should put quotations in pairs of left and right single 'qoute' so that you get the correct left and right double quotation marks. 'For adjacent single and double quotation marks, insert a 'thinspace\thinspace'. You can get en-dashes--like so, and em-dashes---like so.
Example 2;  Indentation

Now let’s see how to control indentation. If an ordinary word processor can do it, so surely can \TeX. Note that this paragraph isn’t indented.

Usually you’ll either want to indent paragraphs or to leave extra space between them. Since we haven’t change anything yet, this paragraph is indented.

Let’s do these two paragraphs a different way, with noindentation and six printer’s point of extra space between paragraphs.

So here’s another paragraph that we’re typesetting without indentation. If we didn’t put space between these paragraphs, you would have had a hard time knowing where one ends and the next begins.

It’s also possible to indent both sides of entire paragraphs. The next three paragraphs illustrate this:

“We’ve indented this paragraph on both sides by the paragraph indentation. This is often a good way to set long quotations.

“You can do multiple paragraphs this way if you choose. This is the second paragraph that’s singly indent.”

You can even make paragraphs doubly narrow if that’s what you need. This is an example of a doubly narrowed paragraph.

In this paragraph we’re back to the normal margins, as you can see for yourself. We’ll let it run on a little longer so that the margins are clearly visible.

Now we’ll indent the left margin by half an inch and leave the right margin at its usual position.

Finally, We’ll indent the right margin by half an inch and leave the left margin at its usual position.
Now let’s see how to control indentation. If an ordinary word processor can do it, so surely can \TeX{}. Note that this paragraph isn’t indented.

Usually you’ll either want to indent paragraphs or to leave extra space between them. Since we haven’t change anything yet, this paragraph is indented.

\parindent = 0pt \parskip = 6pt
\%
% The left brace strats a group containing the unindented text.
Let’s do these two paragraphs a different way, with no indentation and six printer’s point of extra space between paragraphs.

So here’s another paragraph that we’re typesetting without indentation. If we didn’t put space between these paragraphs, you would have had a hard time knowing where one ends and the next begins.
\par % The paragraph *must* be ended within the group.
\}%
% The right brace ends the group containing unindented text.

It’s also possible to indent both sides of entire paragraphs. The next three paragraphs illustrate this:
\smallskip % Provide a little extra space here.
\%
% Skips like this and \vskip below end a paragraph.
\%\narrower
% ‘‘We’ve indented this paragraph on both sides by the paragraph indentation. This is often a good way to set long quotations.
% ‘‘You can do multiple paragraphs this way if you choose. This is the second paragraph that’s singly indent.’’\par
%\%
%\%
\%\narrower % You can even make paragraphs doubly narrow if that’s what you need. This is an example of a doubly narrowed paragraph.\par
\%\vskip 1pc % Skip down one pica for visual separation.
In this paragraph we’re back to the normal margins, as you can see for yourself. We’ll let it run on a little longer so that the margins are clearly visible.
\%\leftskip .5in Now we’ll indent the left margin by half an inch and leave the right margin at its usual position.\par
\%\rightskip .5in Finally, we’ll indent the right margin by half an inch and leave the left margin at its usual position.\par

page 25
Example 3;  

**Fonts and special characters**

Here are a few words in an italic font, a few words in a **boldface** font, and a **mixture** of the two, with two roman words inserted. where an italic font is followed by a nonitalic font, we’ve inserted an “italic correction” (\/) to make the spacing look right. Here’s a smaller word—but the standard TeX fonts don’t give you anything smaller than this.

If you need any of the ten characters:

\$ \& \# \_ \% ^ ~ \{ \} \$

you’ll need to write them a special way. Look at the facing page to see how to do it.

TeX has the accents and letters that you’ll need for French words such as rôle and élève, for German words such as Schuß, and for words in several other languages as well. You’ll find a complete list of TeX’s accents and letters of European languages on page 112 and page 109.

You can also get Greek letters such as “α” and “Ω” for use in math, card suite such as “♠” and “♦” music symbols such as “♯” and “♭”, and many other special symbols that you’ll find listed on page 210. TeX will only accept these sorts of special symbols in its “math mode”, so you’ll need to enclose them within ‘$’ characters.
Here are a few words in an italic font, a few words in a boldface font, and a mixture of the two, with two roman words inserted. If an italic font is followed by a nonitalic font, we've inserted an ‘italic correction’ to make the spacing look right.

Here’s a smaller word—but the standard \TeX{} fonts don’t give you anything smaller than this.

\TeX{} has the accents and letters that you’ll need for French words such as \textit{rôle} and \textit{élève}, for German words such as \textit{Schuss}, and for words in several other languages as well. You’ll find a complete list of \TeX{}’s accents and letters of European languages on page 112 and page 109.

You can also get Greek letters such as ‘\$\alpha$’ and \textit{$\Omega$}, for use in math, card suite such as \textit{\spadesuit} and \textit{\diamondsuit}, music symbols such as ‘\$\sharp$’ and ‘\$\flat$’, and many other special symbols that you’ll find listed on page 210. \TeX{} will only accept these sorts of special symbols in its ‘math mode’, so you’ll need to enclose them within ‘\texttt{\$}’ characters.
Example 4;  *Interline spacing*

Once in a while you any want to print a document with extra space between the line. For instance, bills before Congress are printed this way so that the legislators can mark them up. For the same reason, book publishers usually insist that manuscripts be double-spaced. Double spacing is rarely appropriate for finished documents, however.

A baseline is an imaginary line that acts like the lines on a pad of ruled paper. You can control the interline spacing—what printers call “leading”—by setting the amount of space between baselines. Take a look at the input to see how to do it. You could use the same method for 1 1/2 spacing as well, using 1.5 instead of 2. (You can also write 1 1/2 a nice way.)

For this example we’ve also increased the paragraph indentation and skipped an extra line between paragraphs.
Once in a while you might want to print a document with extra space between the lines. For instance, bills before Congress are printed this way so that the legislators can mark them up. For the same reason, book publishers usually insist that manuscripts be double-spaced. Double spacing is rarely appropriate for finished documents, however.

A baseline is an imaginary line that acts like the lines on a pad of ruled paper. You can control the interline spacing—the printers call it “leading”—by setting the amount of space between baselines. Take a look at the input to see how to do it. You could use the same method for $1\frac{1}{2}$ spacing as well, using \tt 1.5 instead of \tt 2. (You can also write $1\frac{1}{2}$ a nice way.)

% Here we've used the macro definition given above.

For this example we've also increased the paragraph indentation and skipped an extra line between paragraphs.

\}
Example 5;  *Spacing, rules, and boxes*

Here’s an example of a “description list”. In practice you’d be better off using a macro to avoid the repetitive constructs and to make sure that the subhead widths are wide enough:

**Queen of Hearts**  An ill-tempered woman, prone to saying ”Off with his head!” at the slightest provocation.

**Cheshire Cat**  A cat with an enormous smile that Alice found in a tree.

**Mock Turtle**  A lachrymose creature, quite a storyteller, who was a companion to the Gryphon. Reputedly the principal ingredient of Mock Turtle Soup.

Here’s an example of some words in a ruled box, just as Lewis Carroll wrote them:

| Who would not give all else for twopennyworth only of Beautiful Soup? |

*******************************************

Here we’ve gotten the effect of a revision bar on the material in this paragraph. The revision bar might indicate a change.
Here’s an example of a ‘description list’. In practice you’d be better off using a macro to avoid the repetitive constructs and to make sure that the subhead widths are wide enough:

\begin{itemize}
    \item An ill-tempered woman, prone to saying ‘’Off with his head!’’ at the slightest provocation.
    \item A cat with an enormous smile that Alice found in a tree.
    \item A lachrymose creature, quite a storyteller, who was a companion to the Gryphon. Reputedly the principal ingredient of Mock Turtle Soup.
\end{itemize}

Here’s an example of some words in a ruled box, just as Lewis Carroll wrote them:

\begin{quote}
Who would not give all else for tuppennyworth only of Beautiful Soup?
\end{quote}

Here we’ve gotten the effect of a revision bar on the material in this paragraph. The revision bar might indicate a change.
**Example 6; Odds and end**

\[ \text{TEx knows how to hyphenate words, but it isn’t infallible. If you are discussing the chemical 5-[p-(Flouro}\text{sulfonyl})\text{benzoyl]}-1,\text{N}^6\text{-ethenanoadenosine and TEx complains to you about an “overfull hbox”, try inserting some “discretionary hyphens”}. The notation ‘\text{-}' tells TEx about a discretionary hyphen, that is, one that it might not have inserted otherwise.} \]

You can typeset text unjustified, i.e., with an uneven right margin. In the old days, before word processors were common, typewritten documents were unjustified because there was no convenient alternative. Some people prefer text to be unjustified so that the spacing between words can be uniform. Most books are set with justified margins, but not all.

**Assertion 27.** *There is an easy way to typeset the headings of assertions, lemmas, theorems, etc.*

Here’s an example of how to typeset an itemized list two level deep. If you need more levels, you’ll have to program it yourself, alas.

1. This is the first item.
2. This is the second item. It consists of two paragraphs. We’ve indented the second paragraph so that you can easily see where it starts.
   
   The second paragraph has three subitems underneath it.
   
   (a) This is the first subitem.
   (b) This is the second subitem.
   (c) This is the third subitem.

• This is a strange-looking item because it’s completely different from the others.

Here’s a left-justified line. ⇒

⇒Here’s a centered line.⇒

⇒Here’s a right-justified line.
\TeX{} knows how to hyphenate words, but it isn’t infallible. If you are discussing the chemical \$\it 5\$-[p-(Flouro-sul-fonyl)ben-zoyl]-1,\%
\$N^6\$-ethe-no\-adeno\-sine
and \TeX{} complains to you about an ‘‘overfull hbox’’, try inserting some ‘‘discretionary hyphens’’. The notation ‘\tt {\textbackslash \-}’ tells \TeX{} about a dis\-cre\-tion\-ary hyphen, that is, one that it might not have inserted otherwise.

You can typeset text unjustified, I.e., with an uneven right margin. In the old days, before word processors were common, typewritten documents were unjustified because there was no convenient alternative. Some people prefer text to be unjustified so that the spacing between words can be uniform. Most books are set with justified margins, but not all.

Here’s an example of how to typeset an itemized list two level deep. If you need more levels, you’ll have to program it yourself, alas.

```
\item {1.} This is the first item.
\item {2.} This is the second item. It consists of two paragraphs. We’ve indented the second paragraph so that you can easily see where it starts.
\item {} \indent The second paragraph has three subitems underneath it.
\item \item { (a)} This is the first subitem.
\item \item { (b)} This is the second subitem.
\item \item { (c)} This is the third subitem.
\item \$\bullet$ This is a strange-looking item because it’s completely different from the others.
```

Here’s a left-justified line.\$\Leftarrow\$

Here’s a right-justified line.\$\Rightarrow\$

Here’s a centered line.\$\leftarrow\$\$\Rightarrow\$
Example 7;  *Using fonts from other sources*

You aren’t restricted to using the Computer Modern fonts that come with \TeX. Other fonts are available from many sources, and you may prefer them. For instance, we’ve set this page in 10-point Palatino Roman. Palatino was designed by Hermann Zapf, considered to be one of the greatest type designers of the twentieth century. This page will give you some idea of what it looks like.

Fonts can be provided either as outlines or as bitmaps. An outline font describes the shapes of the characters, while a bitmap font specifies each pixel(dot) that makes up each character. A font outline can be used to generate many different sizes of the same font. The Metafont program that’s associated with \TeX provides a particularly powerful way of generating bitmap fonts, but it’s not the only way.

The fact that a single outline can generate a great range of point sizes for a font tempts many vendors of digital typefaces to provide just one set of outlines for a typeface such as Palatino Roman. This may be a sacrifice. Fonts cannot be scaled up and down linearly without loss of quality. Large sizes of letters should not, in general, have the same proportions as smaller sizes; they just don’t look right. For example, a font that’s linearly scaled down will tend to have too little space between strokes, and its X-height will be too small.

A type designer can compensate for these changes by providing different outlines for different point sizes, but it’s necessary to go to the expense of designing these different outlines. One of the great advantages of Metafont is that it’s possible to parameterize the descriptions of characters in a font. Metafont can then maintain the typographical quality of characters over a range of point sizes by adjusting the character shapes accordingly.

Refer; Computer Modern font \\texttt{\rm}

You aren’t restricted to using the Computer Modern fonts that come with \TeX. Other fonts are available from many sources, and you may prefer them. For instance, we’ve set this page in 10-point Palatino Roman. Palatino was designed by Hermann Zapf, considered to be one of the greatest type designers of the twentieth century. This page will give you some idea of what it looks like.

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Fonts can be provided either as outlines or as bitmaps. An outline font describes the shapes of the characters, while a bitmap font specifies each pixel (dot) that makes up each character. A font outline can be used to generate many different sizes of the same font. The Metafont program that's associated with \TeX{} provides a particularly powerful way of generating bitmap fonts, but it's not the only way.

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A type designer can compensate for these changes by providing different outlines for different point sizes, but it's necessary to go to the expense of designing these different outlines. One of the great advantages of Metafont is that it's possible to parameterize the descriptions of characters in a font. Metafont can then maintain the typographical quality of characters over a range of point sizes by adjusting the character shapes accordingly.
Some Choice Edible Mushrooms

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Identifying Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pleurotus ostreatus</em></td>
<td>Oyster mushroom</td>
<td>Grows in shelflike clusters on stumps or logs, pink-gray oyster-shaped caps, stem short or absent.</td>
</tr>
<tr>
<td><em>Lactarius hygrophoroides</em></td>
<td>Milky hygroph</td>
<td>Butterscotch-brown cap and stem, copious white latex, often on ground in woods near streams.</td>
</tr>
<tr>
<td><em>Morchella esculenta</em></td>
<td>White morel</td>
<td>Conical cap with black pits and white ridges; no gills. Often found near old apple trees and dying elms in the spring.</td>
</tr>
<tr>
<td><em>Boletus edulus</em></td>
<td>King bolete</td>
<td>Reddish-brown to tan cap with yellow pores (white when young), bulbous stem, often near conifers, birch, or aspen.</td>
</tr>
</tbody>
</table>
\header{A rule table} see p. 21

\offinterlineskip % So the vertical rules are connected.
% \tablerule constructs a thin rule across the table.
def\tablerule{\noalign{\hrule}}
% \tableskip creates 9pt of space between entries.
def\tableskip{\omit&height 9pt&\omit&\omit\cr}
% & separates templates for each column. TeX substitutes
% the text of the entries for #. We must have a strut
% present in every row of the table; otherwise, the boxes
% won't butt together properly, and the rules won't join.
\halign{\tabskip = .7em plus 1em % glue between columns
% Use \vtop for short multiline entries in the first column.
% Typeset the lines ragged right, without hyphenation.
\vtop{\hsize=6pc\pretolerance = 10000\hbadness = 1000
\normalbaselines\noindent\it#\strut} &
&
&
&
&
% Use \vtop to get whole paragraphs in the last column.
&\vtop{\hsize=11pc \parindent=0pt \normalbaselineskip=12pt
\normalbaselines \rightskip=3pt plus2em #}
\cr
% The table rows begin here.
\noalign{\hrule height2pt depth2pt \vskip3pt}
% The header row spans all the columns.
\multispan5\bf Some Choice Edible Mushrooms\hfil\strut\cr
\noalign{\vskip -2pt}% close up lines of heading
\bf Botanical&&\bf Common&&\bf Identifying \hfil\cr
\noalign{\vskip -2pt}% close up lines of heading
\bf Name&&\bf Name &&\bf Characteristics \hfil\cr
\bf Pleurotus ostreatus&&Oyster mushroom&&
Grows in shelf\kern 1pt like clusters on stumps or logs,
% without the kern, the eff and elf would be too close
pink-gray oyster-shaped caps, stem short or absent.\cr
\bf Lactarius hygrophoroides&&Milky hygroph&&
Butterscotch-brown cap and stem, copious white latex,
often on ground in woods near streams.\cr
\bf Morchella esculenta&&White morel&&Conical cap
with black pits and white ridges; no gills. Often found
near old apple trees and dying elms in the spring.\cr
\bf Boletus edulus&&King bolete&&Reddish-brown to
tan cap with yellow pores (white when young),
bulbous stem, often near conifers, birch, or~aspen.\cr
}
Example 9; Typesetting mathematics

For a spherical triangle with sides $A$, $b$, and $c$, and oppsits angles $\alpha$, $\beta$, and $\gamma$, we have:

$$\cos \alpha = -\cos \beta \cos \gamma + \sin \beta \sin \gamma \cos \alpha \quad \text{(Law of Cosines)}$$

and:

$$\tan \frac{\alpha}{2} = \sqrt{-\cos \sigma \cdot \cos (\sigma - \alpha)}$$

where $\sigma = \frac{1}{2}(a + b + c)$

We also have:

$$\sin x = \frac{e^{ix} - e^{-ix}}{2i}$$

and:

$$\int_{0}^{\infty} \frac{\sin ax \sin bx}{x^2} \, dx = \frac{\pi a}{2}$$

if $a < b$

The number of combinations $\binom{n}{r}$ of $n$ things taken $r$ at a time is:

$$C(n, r) = \binom{n}{r} = \frac{n(n-1) \cdots (n-r+1)}{r(r-1) \cdots (1)} = \frac{n!}{r!(n-r)!}$$

The value of the determinant $D$ of order $n$:

$$D = \begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{vmatrix}$$

is defined as the sum of $n!$ terms:

$$\sum (\pm) a_{1i}a_{2j} \cdots a_{nk}$$

where $i, j, \ldots, k$ take on all possible values between 1 and $n$, and the sign of the product is $+$ if the sequence $i, j, \ldots, k$ is an even permutation and $-$ otherwise. Moreover:

$$Q(\xi) = \lambda_1 y_1^2 \sum_{i=2}^{n} \sum_{j=2}^{n} y_i b_{ij} y_j, \quad B = |b_{ij}| = B'$$

- 38-
For a spherical triangle with sides $A$, $b$, and $c$, and opposite angles $\alpha$, $\beta$, and $\gamma$, we have:

\[
\cos \alpha = -\cos \beta \cos \gamma + \sin \beta \sin \gamma \cos \alpha \quad \text{(Law of Cosines)}
\]

and:

\[
\tan \frac{\alpha}{2} = \sqrt{\frac{-\cos \sigma \cos(\sigma - \alpha)}{\cos(\sigma - \beta) \cos(\sigma - \gamma)}}, \quad \text{where } \sigma = \frac{1}{2}(a+b+c)
\]

We also have:

\[
\sin x = \frac{e^{ix} - e^{-ix}}{2i}, \quad \text{if } a < b
\]

The number of combinations $\binom{n}{r}$ of $n$ things taken $r$ at a time is:

\[
\binom{n}{r} = \binom{n}{r} = \binom{n}{r} = \frac{n(n-1) \cdots (n-r+1)}{r(r-1) \cdots (1)} = \frac{n!}{r!(n-r)!}
\]

The value of the determinant $D$ of order $n$:

\[
D = \left|\begin{array}{cccc}
a_{11} & a_{12} & \ldots & a_{1n} \\
a_{21} & a_{22} & \ldots & a_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
a_{n1} & a_{n2} & \ldots & a_{nn}
\end{array}\right|
\]

is defined as the sum of $n!$ terms:

\[
\sum (\pm) a_{1i}a_{2j} \ldots a_{nk}
\]

where $i$, $j$, \dots, $k$ take on all possible values between 1 and $n$, and the sign of the product is $+$ if the sequence $i$, $j$, \dots, $k$ is an even permutation and $-$ otherwise. Moreover:

\[
Q(\xi) = \lambda_1 y_1^2 \sum_{i=2}^n \sum_{j=2}^n y_i b_{ij} y_j, \quad B = \sqrt{\sum_{ij} b_{ij}}, \quad B' = \sqrt{B^2}
\]
Example 10;  More mathematics

The absolute value of $X$, $|x|$, is defined by:

$$|x| = \begin{cases} 
  x, & \text{if } x \geq 0; \\
  -x, & \text{otherwise.}
\end{cases}$$

Now for some numbered equations. It is the case that for $k \geq 0$:

$$x^{k^2} = \underbrace{x \cdot x \cdots x}_{2k \text{ times}}$$  \hspace{1cm} (1)

Her’s an example that shows some spacing controls, with a number on the left:

(2a) $[u][v][w][x][y][z]$

The amount of space between the items in brackets gradually increases from left to right, (we’ve made the space between the first two items be less than the natural space.) It is sometimes the case that

(2b) $u_1 + tu_2'' = u_2 + tu_1''$

(2c) $\hat{i} \neq \hat{j}$

$\vec{a} \approx \vec{b}$

The result is of order $0(n \log \log n)$. Thus

$$\sum_{i=1}^{n} x_i = x_1 + x_2 + \cdots + x_n = \text{Sum}(x_1, x_2, \ldots, x_n).$$  \hspace{1cm} (3)

and

$$dx \, dy = r \, dr \, d\theta.$$  \hspace{1cm} (4)

The set of all $q$ such that $q \leq 0$ is written as:

$$\{ q \mid q \leq 0 \}$$

Thus

$$\forall x \exists y \, P(x,y) \Rightarrow \exists x \exists y \, P(x,y)$$

where

$$(x, y) \overset{\text{def}}{=} \text{any predicate in } x \text{ and } y.$$
The absolute value of \(X\), \(|x|\), is defined by:
\[
|x| = \begin{cases} 
  x, & \text{if } x \ge 0; \\
  -x, & \text{otherwise}.
\end{cases}
\]

Now for some numbered equations.
It is the case that for \(k \ge 0\):
\[
x^{k^2} = \underbrace{x \cdot x \cdots x}_{2k \text{ times}}
\tag{1}
\]

Here’s an example that shows some spacing controls, with a number on the left:
\[
[u]\![v]\![w]\![x]\![y]\![z]\leqno(2a)
\]
The amount of space between the items in brackets gradually increases from left to right, (we’ve made the space between the first two items be \{\it less\} than the natural space.)
It is sometimes the case that
\[
\begin{aligned}
  u'_1 + tu''_2 &= u'_2 + tu''_1 \\
  \hat\imath &\ne \hat\jmath
\end{aligned}
\tag{2b}
\]
\[
\vec{a} \approx \vec{b}
\tag{2c}
\]

% The \vphantom is an invisible rule as tall as a ‘b’. The result is of order \(O(n \log \log n)\). Thus
\[
\begin{aligned}
  \sum_{i=1}^n x_i &= x_1 + x_2 + \cdots + x_n \\
  \sum_{i=1}^n x_i &= \text{Sum}(x_1, x_2, \ldots, x_n).
\end{aligned}
\tag{3}
\]
and
\[
dx \, dy = r \, dr \, d\theta
\tag{4}
\]
The set of all \(q\) such that \(q \le 0\) is written as:
\[
\forall x \exists y; P(x,y) \Rightarrow \exists x \exists y; P(x,y)
\]
where
\[
(x,y) \ \buildrel \rm def \over \equiv \ hbox{\rm any predicate in } x \text{ and } y
\]
Thus