Horizontal spacing in maths

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LATEX is obviously pretty good at typesetting maths — it was one of the chief aims of the core TEX system that LATEX extends. However, it can't always be relied upon to accurately interpret formulae in the way you did. It has to make certain assumptions when there are ambiguous expressions. The result tends to be slightly incorrect horizontal spacing. In these events, the output is still satisfactory, yet, any perfectionists will no doubt wish to *fine-tune* there formulae to ensure spacing is correct. These are generally very subtle adjustments.

There are other occasions where LATEX has done its job correctly, but you just want to add some space, maybe to add a comment of some kind. For example:

$$f(n) = \left\{ \begin{array}{l l} n/2 & \quad \mbox{if } n \mbox{ is even} \\ -(n+1)/2 & \quad \mbox{if } n \mbox{ is odd} \end{array} \right.$$

It's preferable in this example to ensure there is a decent amount of space between the maths and the text. This was achieved using the following code:

```
\[f(n) = \left\{
\begin{array}{l l}
  n/2 & \quad \mbox{if $n$ is even}\\
  -(n+1)/2 & \quad \mbox{if $n$ is odd}\\ \end{array} \right. \]
```

LATEX has defined two commands that can be used anywhere in documents (not just maths) to insert some horizontal space. They are:

```
\quad   \qquad
```

A \quad is a space equal to the current font size. So, if you are using an 11pt font, then the space provided by \quad will be 11pt (horizontally, of course.) The \qquad gives twice that amount. As you can see from the code from the above example, \quads were used to add some separation between the maths and the text.

Ok, so back to the fine tuning as mentioned at the beginning of the document. A good example would be displaying the simple equation for the indefinite integral of *y* with respect to *x*:

$$\int y \, \mathrm{d}x$$

If you were to try this, you may write:

```
\[ \int y \mathrm{d}x \]
```

Which gives,

$$\int y\mathrm{d}x$$

However, this doesn't give the correct result. LaTeX doesn't respect the whitespace left in the code to signify that the y and the $\mathrm{d}x$ are independent entities. Instead, it lumps them altogether. A `\quad` would clearly be overkill is this situation — what is needed are some small spaces to be utilised in this type of instance, and that's what LaTeX provides:

Command	Description	Size
`\,`	small space	3/18 of a quad
`\:`	medium space	4/18 of a quad
`\;`	large space	5/18 of a quad
`\!`	negative space	−3/18 of a quad

NB you can use more than one command in a sequence to achieve a greater space if necessary.

To rectify the current problem:

```
\int y\, \mathrm{d}x
```
$\int y\,\mathrm{d}x$

```
\int y\: \mathrm{d}x
```
$\int y\:\mathrm{d}x$

```
\int y\; \mathrm{d}x
```
$\int y\;\mathrm{d}x$

The negative space may seem like an odd thing to use, however, it wouldn't be there if it didn't have *some* use! Take the following example:

$$\binom{n}{r} = {}^nC_r = {}^nC_r = \frac{n!}{r!(n-r)!}$$

The matrix-like expression for representing binomial coefficients is too padded. There is too much space between the brackets and the actual contents within. This can easily be corrected by adding a few negative spaces after the left bracket and before the right bracket.

$$\binom{n}{r} = {}^nC_r = \frac{n!}{r!(n-r)!}$$

```
\[\left(\!\!\!
  \begin{array}{c}
    n \\
    r
  \end{array}
  \!\!\!\right) = {^n}C_r = \frac{n!}{r!(n-r)!}
\]
```