Answers to LaTeX Exercises

▷ Answer 1

Copy this file to your directory and look up how to process it in the local guide. Note how the input `.tex` file contains quite verbose instructions in plain text, which are the typesetting commands.

▷ Answer 2

To include color in a file you need to add

```
\usepackage{color}
```

in the preamble and then `\textcolor{red}{red text}` in the text to get red text.

▷ Answer 3

I entered the room and—horrors—I saw both my father-in-law and my mother-in-law.

The winter of 1484–1485 was one of discontent.

Frank wondered, “Is this a girl that can’t say ‘No!’?”

Does Æschylus understand Œdipus?

They took some honey and plenty of money wrapped up in a £5 note.

Élèves, refusez vos leçons! Jetez vos chaînes!

Can you take a ferry from Öland to Åland?

```
I entered the room and---horrors---I saw both my
father-in-law and my mother-in-law.

The winter of 1484--1485 was one of discontent.

Frank wondered, ‘‘Is this a girl that can’t say ‘No!’?’’

Does \AE schylus understand \OE dipus?

They took some honey and plenty of money wrapped up in a
\pounds 5 note.

\’El\‘eves, refusez vos le\c cons! Jetez vos cha\^\i nes!

Can you take a ferry from \"Oland to \AA land?
```

▷ Answer 4

Don’t forget to run LaTeX twice to make sure the table of contents is up to date.

▷ Answer 5

1. You can mix list environments as much as you like
   - But it might start to look silly
   - With different symbols
2. So do remember

   Stupid things will not become smart because they are in a list.

   Smart things, though, can be presented beautifully in a list.

```
\begin{enumerate}
\item You can mix list environments as much as you like
\begin{itemize}
\item But it might start to look silly
\item[-]With different symbols
\end{itemize}
\item So do remember
\begin{description}
\item[Stupid] things will not become smart because they are in a list.
\item[Smart] things, though, can be presented beautifully in a list.
\end{description}
```

▷ Answer 6

Vegetable Production

Vegetable	Comments	Weight
Carrots	Good early crop, then carrot fly.	7kg
Lettuce	Slow to start, then bolted.	1kg
French beans	Excellent.	12kg

```
\begin{center}
\medskip

{\large \bf Vegetable Production}

\begin{tabular}{|l|l|r|} \hline
{\textsf Vegetable } & {\textsf Comments} & {\textsf Weight}\\
\hline \hline
Carrots & Good early crop, then carrot fly. & 7kg \\
Lettuce & Slow to start, then bolted. & 1kg \\
French beans & Excellent. & 12kg \\ \hline
\end{tabular}
\end{center}
```

▷ Answer 7

Currencies 1 Jan 1992

London:	New York:
£: $ 1.8672	£: $ 1.8655
£: DM 2.8369	$: DM 1.5175
£: FFr 9.969080	$: FFr 5.1845

```
\begin{center}
\medskip
{\Large \bfseries Currencies 1 Jan 1992}\\
\bigskip
\begin{tabular}{ll}
\sffamily \large London: & \sffamily\large New York:\\ \hline \hline
\pounds : \$ 1.8672 &\pounds : \$ 1.8655 \\
\pounds : DM 2.8369 &\$: DM 1.5175\\
\pounds : FFr 9.969080 &\$: FFr 5.1845
\end{tabular}
\end{center}
```

▷ Answer 8

$C(n,r) = n!/(r!\,(n-r)!)$.

```
$C(n,r)=n!/(r!\,(n-r)!).$
```

▷ Answer 9

This equation is in-line $a+b=c-d=xy=w/z$ and the following one is displayed.

$$a+b=c-d=xy=w/z$$

```
This equation is in-line $a+b=c-d=xy=w/z$ and the following
one is displayed. $$a+b=c-d=xy=w/z$$
```

▷ Answer 10

An in-line example: $(fg)' = f'g + fg'$ followed by one that is displayed:

$$(fg)' = f'g + fg'$$

```
An in-line example: $(fg)' = f'g + fg'$ followed by one
that is displayed: $$(fg)' = f'g + fg'$$
```

▷ Answer 11

In-line the equation is $\alpha\beta = \gamma + \delta$ and displayed

$$\alpha\beta = \gamma + \delta$$


```
In-line the equation is $\alpha\beta =\gamma+\delta$ and displayed
$$\alpha \beta = \gamma + \delta$$
```

▷ Answer 12

In-line the equation is $\Gamma(n) = (n-1)!$ and displayed

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```
In-line the equation is $\Gamma (n) = (n-1)!$ and displayed
 $$\Gamma (n) = (n-1)!$$
```

▷ Answer 13

$x \wedge (y \vee z) = (x \wedge y) \vee (x \wedge z)$.

```
$x\wedge (y\vee z) = (x\wedge y) \vee (x\wedge z)$.
```

▷ Answer 14

$2 + 4 + 6 + \cdots + 2n = n(n+1)$.

```
$2 + 4 + 6 + \cdots + 2n = n(n+1).$
```

▷ Answer 15

$\vec x \cdot \vec y = 0$ if and only if $\vec x \perp \vec y$.

```
$\vec x\cdot \vec y = 0$ if and only if $\vec x \perp \vec y$.
```

▷ Answer 16

$\vec x \cdot \vec y \neq 0$ if and only if $\vec x \not\perp \vec y$.

```
$\vec x\cdot \vec y \not= 0$ if and only if $\vec x \not\perp \vec y.$
```

or use $\vec x \cdot \vec y \neq 0$ which is `$\vec x\cdot \vec y \ne 0$`

▷ Answer 17

$(\forall x \in \mathbb{R})(\exists y \in \mathbb{R})$ such that $y > x$.

```
$(\forall x \in \mathbb{R}) (\exists y \in \mathbb{R})$ such that $y>x.$
```

Note that amssymb must be included in the usepackage declaration at the beginning of the file in order to use `\mathbb{R}`.

▷ Answer 18

$\frac{a+b}{c} \quad \frac{a}{b+c} \quad \frac{1}{a+b+c} \neq \frac{1}{a} + \frac{1}{b} + \frac{1}{c}$.

```
$\frac{a+b}{c}\quad \frac{a}{b+c}\quad \frac{1}{a+b+c} \not=
\frac{1}{a}+\frac{1}{b}+\frac{1}{c}.$
```

\ne could be used instead of \not=

▷ Answer 19

What are the points where $\frac{\partial}{\partial x}f(x,y) = \frac{\partial}{\partial y}f(x,y) = 0$?

```
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{\partial}{\partial y}f(x,y)=0$?
```

▷ Answer 20

$e^x \quad e^{-x} \quad e^{i\pi}+1=0 \quad x_0 \quad x_0^2 \quad {x_0}^2 \quad 2^{x^x}$.

```
$e^x \quad  e^{-x}  \quad e^{i\pi}+1=0 \quad x_0 \quad  x^2_0
\quad  {x_0}^2\quad  2^{x^x}$.
```

▷ Answer 21

$\nabla^2 f(x,y) = \frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2}$.

```
$\nabla^2 f(x,y) = \frac{\partial^2 f}{\partial x^2}
+ \frac{\partial^2 f}{\partial y^2}$.
```

▷ Answer 22

$\lim_{x\to 0} (1+x)^{\frac{1}{x}}=e$.

```
$\lim_{x\to 0} (1+x)^{\frac{1}{x}}=e$.
```

▷ Answer 23

The cardinality of $(-\infty, \infty)$ is $\aleph_1$.

```
The cardinality of $(-\infty ,\infty)$ is $\aleph_1$.
```

▷ Answer 24

$\lim_{x\to 0^+} x^x = 1$.

```
$\lim_{x\to {0^+}} x^x = 1$.
```

▷ Answer 25

$\int_0^1 3x^2 \,\mathrm{d}x = 1$.

```
$\int_0^1 \,3x^2\,\mathrm{d}x=1$.
```

▷ Answer 26

$\sqrt{2} \quad \sqrt{\frac{x+y}{x-y}} \quad \sqrt[3]{10} \quad e^{\sqrt{x}}$.

```
$\sqrt2 \quad \sqrt \frac{x+y}{x-y} \quad \root 3 \of {10}$
\quad $e^{\sqrt x}$.
```


▷ Answer 27

$\|x\| = \sqrt{x \cdot x}$.

```
$\|x\| = \sqrt{x\cdot x}$.
```

▷ Answer 28

$\phi(t) = \frac{1}{\sqrt{2\pi}} \int_0^t e^{-x^2/2}\,\mathrm{d}x$.

```
$\phi(t) = \frac{1}{\sqrt{2_\pi}} \int_0^t \, e^{-x^{2}/2},\mathrm{d}x$.
```

▷ Answer 29

$\underline{x} \quad \overline{y} \quad \underline{\overline{x+y}}$.

```
$\underline x \quad \overline y \quad \underline{\overline{x+y}}$.
```

▷ Answer 30

$\left\lceil \left\lfloor x \right\rfloor \right\rceil \leq \left\lfloor \left\lceil x \right\rceil \right\rfloor$.

```
$\bigl\lceil \lfloor x\rfloor \bigr\rceil
   \leq \bigl\lfloor \lceil x\rceil \bigr\rfloor$.
```

▷ Answer 31

$\sin(2\theta) = 2\sin\theta\cos\theta \quad \cos(2\theta) = 2\cos^2\theta - 1$.

```
$\sin(2\theta ) = 2 \sin\theta\cos\theta \quad \cos(2\theta)
 = 2\cos^2\theta - 1$.
```

▷ Answer 32

$$\int \csc^2 x\,\mathrm{d}x = -\cot x + C \qquad \lim_{\alpha\to 0} \frac{\sin\alpha}{\alpha} = 1 \qquad \lim_{\alpha\to\infty} \frac{\sin\alpha}{\alpha} = 0.$$

```
$$\int \csc^2x\,  \mathrm{d}x = -\cot x + C
\qquad \lim_{\alpha\to 0} \frac{\sin\alpha}{\alpha} = 1
\qquad \lim_{\alpha \to \infty} \frac{\sin\alpha}{\alpha} = 0.$$
```

▷ Answer 33

$$\tan(2\theta) = \frac{2\tan\theta}{1-\tan^2\theta}.$$

```
$$\tan (2\theta) = \frac{2\tan\theta}{1-\tan^2\theta}.$$
```

▷ Answer 34

$$\left[
\begin{array}{ccc}
aa & \cdots & az \\
\vdots & \ddots & \vdots \\
za & \cdots & zz
\end{array}
\right]$$

▷ Answer 35

A random variable Y has density

$$f(y;\theta,\phi) = \exp\left\{\frac{y\theta - b(\theta)}{a\phi} + c(y;\phi)\right\}$$

and its moment-generating function is $M(t) = \exp[\{b(\theta + ta\phi) - b(\theta)\}/(a\phi)]$.

```
A random variable $Y$ has density
$$f(y;\theta,\phi) = \exp\left\{ \frac{y\theta-b(\theta)}
{a\phi} + c(y;\phi)\right\}$$
and its moment-generating function is $M(t)
 $M(t) = \exp[ \{b(\theta+ta\phi) - b(\theta)\}/(a\phi)]$.
```

▷ Answer 36

If Y_{rc}, $r = 1,\ldots,R$, $c = 1,\ldots,C$ are random variables, show that

$$\sum_{r,c}(Y_{rc} - \overline{Y}_{..})^2 = \sum_{r,c}(\overline{Y}_{r.} - \overline{Y}_{..})^2 + \sum_{r,c}(\overline{Y}_{.c} - \overline{Y}_{..})^2 + \sum_{r,c}(Y_{rc} - \overline{Y}_{.c} - \overline{e}Y_{..})^2. \qquad (1)$$

```
If $Y_{rc}$, $r=1,\ldots, R$, $c=1,\ldots, C$ are random variables,
show that
\begin{equation}
\label{linear.models.equation.1}
\sum_{r,c} (Y_{rc}-\overline Y_{..})^2
= \sum_{r,c} (\overline Y_{r.}-\overline Y _{..})^2 + \sum_{r,c}
(\overline Y_{.c}-\overline Y_{..})^2 + \sum_{r,c} (Y_{rc}
- \overline Y_{.c} - \overline e Y_{..})^2.
\end{equation}
```

▷ Answer 37

$$f(x_i \,|\, \lambda_i) = \lambda_i e^{-\lambda_i x_i}, \qquad f(y_i \,|\, \lambda_i, \psi) = \lambda_i\psi e^{-\lambda_i\psi y_i}, \qquad x_i, y_i \geq 0.$$


```
$$f(x_i\,|\,\lambda_i) = \lambda_i e^{-\lambda_i x_i}, \qquad
f(y_i\,|\,\lambda_i, \psi) = \lambda_i\psi e^{-\lambda_i\psi y_i},
\qquad x_i, y_i \ge 0.$$
```

You could use `\mid`, but the spacing would be larger.

▷ Answer 38

$$\frac{\partial G}{\partial t} = \lambda s(s-1)\frac{\partial G}{\partial s}.$$

```
$$\frac{\partial G}{\partial t} = \lambda s(s-1)
\frac{\partial G}{\partial s}.$$
```

▷ Answer 39

1. Generate independent uniforms U and U_1.
2. Set $\begin{cases} X = 1/(4U-1), V = U_1/X^2 & \text{if } U < 0.5, \\ X = 4U - 3, V = U_1 & \text{otherwise.} \end{cases}$
3. If $V < 1 - 0.5|X|$ go to 5.
4. If $V \geq (1 + X^2/\nu)^{-(\nu+1)/2}$ go to 1.
5. Return X.

```
\begin{enumerate}
\item Generate independent uniforms $U$ and $U_1$.
\item $
\mbox{Set } \begin{cases}
X = 1/(4U - 1), V = U_1/X^2& \mbox{if $U < 0.5$,}\\
X = 4U - 3, V = U_1 & \mbox{otherwise}.
\end{cases}
$
\item If $V < 1 - 0.5|X|$ go to 5.
\item If $ V \ge (1 + X^2/\nu)^{-(\nu+1)/2}$ go to 1.
\item Return $X$.
\end{enumerate}
```

The amsmaths cases environment was used here.

▷ Answer 40

$$h_i(t) = \lim_{\epsilon\to 0}\frac{1}{\epsilon}\frac{\mathsf{P}(t < T_i \leqslant t+\epsilon)}{\mathsf{P}(T_i > t)}.$$

```
\renewcommand{\Pr}{\mathsf{P}}
$$h_i(t)=\lim_{\epsilon\to 0} \frac{1}{\epsilon}
\frac{\Pr(t<T_i\leqslant t+\epsilon)}{\Pr(T_i>t)}.$$
```

▷ Answer 41

To create a cross reference to a figure you need to set a label with an arbitrary name

```
\label{Plot1}
```

within the figure environment and then use

```
\pageref{Plot1}
```

to refer to it. So use

```
this plot is on page \pageref{Plot1}
```

to see “ this plot is on page 9 ”.

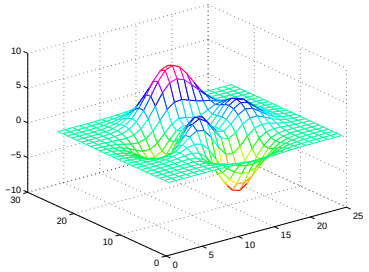

Figure 1: A plot with a reference

See page 9 for example.

Note that you will see

```
LaTeX Warning: There were undefined references.
```

so run LaTeX twice to get the references resolved.

▷ Answer 42

Remember that you need to run LaTeX twice, then bibtex and then LaTeX twice again to get all the references sorted out.