

Exercises (May 2, 2018):

1. Typeset

$$\begin{array}{lll} a = b & c = d & e = f \\ g = b & h = d & k = f \end{array}$$

2. Typeset

$$a^2 = b^2 + c^2$$

3. Typeset two of these: φ , σ , ϑ , Ξ , ϱ

4. Typeset

$$F = G_N \frac{m_1 m_2}{r^2}$$

5. Typeset

$$n_{\pm}(E, T) = \frac{1}{e^{\frac{E}{k_B T}} \pm 1} = \frac{1}{e^{\hbar\omega/k_B T} \pm 1}$$

Note: This uses the greek letter ω and the symbol \hbar .

6. Typeset

$$F_{\mu\nu} = [D_{\mu}, D_{\nu}] = \partial_{\mu} A_{\nu} - \partial_{\nu} A_{\mu} = \partial_{[\mu} A_{\nu]}$$

Note: This uses the greek letters μ and ν , and the symbol ∂ .

7. Typeset these (the first is inline, the next two are separate displayed equations):

“Taylor expansion $e^x = \sum_{n=0}^{\infty} \frac{1}{n!} x^n$.”

$$\int_0^1 \frac{df}{dx} dx = f(1) - f(0)$$

$$e^{\zeta(s)} = \prod_{n=1}^{\infty} e^{1/n^s}$$

(This uses the greek letter zeta).

Solutions

Exercise 1: `\begin{align*}`
`a&=b & c&=d & e&=f \\`
`g&=b & h&=d & k&=f`
`\end{align*}`

Note: the star in `align*` is used in order to omit equation numbering.

Exercise 2: `\item Typeset`
`\[`
`a^2=b^2+c^2`
`\]`
`\bigskip`

Exercise 3: Use package *wasysym* for `\female`, `\male`, `\taurus`, *amssymb* for `\boxminus`, and *tipa* for `\textschwa`

Exercise 4: `\[`
`F = G_N\frac{m_1m_2}{r^2}`
`\]`
`\bigskip`

Exercise 5: `\[`
`n_{\pm}(E,T)=\frac{1}{\hbar}\frac{e^{\frac{E}{k_{BT}}}}{k_{BT}}`
`=\frac{1}{\hbar}\frac{e^{\frac{E}{k_{BT}}}}{k_{BT}}`
`\]`
`\bigskip`

Exercise 6: `\[`
`F_{\mu\nu} = [D_{\mu} , D_{\nu}]`
`=\partial_{\mu} A_{\nu}-\partial_{\nu} A_{\mu}`
`=\partial_{\mu} A_{\nu}-\partial_{\nu} A_{\mu}`
`\]`

Exercise 7: ‘‘Taylor expansion $e^x = \sum_{n=0}^{\infty} \frac{1}{n!} x^n$.’’
`\[\int_0^1 \frac{df}{dx} dx = f(1)-f(0)\]`
`\[e^{\zeta(s)} = \prod_{n=1}^{\infty} e^{1/n^s}\]`

Exercises (May 9, 2018):

1. Typeset

$$F = G_N \frac{m_1 m_2}{r^2}$$

2. Typeset

$$n_{\pm}(E, T) = \frac{1}{e^{\frac{E}{k_B T}} \pm 1} = \frac{1}{e^{\hbar\omega/k_B T} \pm 1}$$

Note: This uses the greek letter ω and the symbol \hbar .

3. Typeset

$$F_{\mu\nu} = [D_{\mu}, D_{\nu}] = \partial_{\mu} A_{\nu} - \partial_{\nu} A_{\mu} = \partial_{[\mu} A_{\nu]}$$

Note: This uses the greek letters μ and ν , and the symbol ∂ .

4. Typeset these (the first is inline, the next two are separate displayed equations):

“Taylor expansion $e^x = \sum_{n=0}^{\infty} \frac{1}{n!} x^n$.”

$$\int_0^1 \frac{df}{dx} dx = f(1) - f(0)$$

$$e^{\zeta(s)} = \prod_{n=1}^{\infty} e^{1/n^s}$$

(This uses the greek letter zeta).

5. Typeset these two expressions as separate *displayed equations*:

$$2 \left[3 \frac{a}{z} + 2 \left(\frac{a}{d} + 7 \right) \right] \quad x^2 \left(\sum_n A_n + 3 \left(b + \frac{1}{c} \right) \right) \Big|_0$$

6. Typeset this, using the `multline*` environment:

$$2 \left(1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \frac{1}{2^4} + \frac{1}{2^5} + \frac{1}{2^6} + \frac{1}{2^7} + \frac{1}{2^8} + \frac{1}{2^9} + \frac{1}{2^{10}} + \frac{1}{2^{11}} \right) = \frac{4095}{1024}$$

7. Make the first entry of Exercise 5 look like this:

$$2 \left[3 \frac{a}{z} + 2 \left(\frac{a}{d} + 7 \right) \right]$$

Solutions

Exercise 1:
$$F = G_N \frac{m_1 m_2}{r^2}$$

Exercise 2:
$$n_{\pm}(E, T) = \frac{1}{\exp\left(\frac{E}{k_{BT}}\right) \pm 1} = \frac{1}{\exp\left(\frac{\hbar\omega}{k_{BT}}\right) \pm 1}$$

Exercise 3:
$$F_{\mu\nu} = [D_{\mu}, D_{\nu}] = \partial_{\mu} A_{\nu} - \partial_{\nu} A_{\mu} = \partial_{\mu} A_{\nu} - \partial_{\nu} A_{\mu}$$

Exercise 4: ‘‘Taylor expansion $e^x = \sum_{n=0}^{\infty} \frac{1}{n!} x^n$.’’

$$\int_0^1 \frac{df}{dx} dx = f(1) - f(0)$$

$$e^{\zeta(s)} = \prod_{n=1}^{\infty} e^{1/n^s}$$

Exercise 5:
$$2 \left[3 \frac{a}{z} + 2 \left(\frac{a}{d} + 7 \right) \right]$$

 and

$$\left[\left(x^2 \left(\sum_n A_n + 3 \left(b + \frac{1}{c} \right) \right) \right) \right]_0$$

Exercise 6:
$$2 \left(1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \frac{1}{2^4} + \frac{1}{2^5} + \frac{1}{2^6} + \frac{1}{2^7} + \frac{1}{2^8} + \frac{1}{2^9} \right) \left(1 + \frac{1}{2^{10}} + \frac{1}{2^{11}} \right) = \frac{4095}{1024}$$

Exercise 7:
$$2 \text{Bigg} \left[3 \frac{a}{z} + 2 \text{bigg} \left(\frac{a}{d} + 7 \right) \text{Bigg} \right]$$

Exercises (May 16, 2018):

1. Typeset: The Pauli matrices are:

$$\sigma^1 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \quad \sigma^2 = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix} \quad \text{and} \quad \sigma^3 = \begin{pmatrix} 1 & \\ 0 & -1 \end{pmatrix}$$

Note: The blank in the 2nd entry of the 1st row of σ^3 is a deliberate typo

2. Typeset this:

$$\left\| \begin{array}{c|c} a \times b & c + d \\ \alpha & \gamma \\ \hline 3 & 1.1 \end{array} \right\|$$

3. Typeset this:

Jersey	First Name	Last Name
10	Cristiano	Ronaldo
11	Didier	Drogba

4. Modify the previous table to typeset this:

Jersey	First Name	Last Name
10	Cristiano	Ronaldo
10	Edson	Arantes do Nascimento (Pele)
11	Didier	Drogba

5. Typeset this:

Shape	Area	Perimeter
Disk of radius R	πR^2	$2\pi R$
Rectangle of sides L_1 and L_2	$L_1 L_2$	$2(L_1 + L_2)$
Square of side $L_1 = L_2$		
Right triangle, base b and height h	$\frac{1}{2}bh$	$b + h + \sqrt{b^2 + h^2}$

6. Optional exercise: Typeset this (note the alignment at equal sign)

a	$x^2 + y = 30$
b	$100 = \sin(\theta) + \cos \varphi$
c	$q \cup p = q \cap p$

Solutions

Exercise 1: The Pauli matrices are:

```
\[\sigma^1=\begin{pmatrix}0&1\\1&0\end{pmatrix},\quad
\sigma^2=\begin{pmatrix}0&-i\\i&0\end{pmatrix}\quad\text{and}\quad
\sigma^3=\begin{pmatrix}1&0\\0&-1\end{pmatrix}\quad \]
```

Exercise 2: $\left[\begin{array}{|r|l|} \hline a \times b & c+d \\ \hline \alpha & \gamma \\ \hline 3 & 1.1 \\ \hline \end{array} \right]$

```
\begin{array}{|r|l|}
a\times b&c+d\\
\alpha &\gamma\\
\hline
3&1.1
\end{array}\quad \]
```

Exercise 3: $\begin{center} \begin{tabular}{c|l|l} \hline Jersey & First Name & Last Name \\ \hline 10 & Cristiano & Ronaldo \\ \hline 11 & Didier & Drogba \\ \hline \end{tabular} \end{center}$

```
\begin{center}
\begin{tabular}{c|l|l}
Jersey & First Name & Last Name \\
\hline\hline
10 & Cristiano & Ronaldo \\
\hline
11 & Didier & Drogba
\end{tabular}
\end{center}
```

Exercise 4: $\begin{center} \begin{tabular}{c|l|l} \hline Jersey & First Name & Last Name \\ \hline 10 & Cristiano & Ronaldo \\ \hline 10 & Edson & Arantes do Nascimento (Pele) \\ \hline 11 & Didier & Drogba \\ \hline \end{tabular} \end{center}$

```
\begin{center}
\begin{tabular}{c|l|l}
Jersey & First Name & Last Name \\
\hline\hline
10 & Cristiano & Ronaldo \\
\hline
10 & Edson & Arantes do Nascimento (Pele) \\
\hline
11 & Didier & Drogba
\end{tabular}
\end{center}
```

Exercise 5: $\begin{center} \begin{tabular}{|p{2in}|c|c|} \hline Shape&Area&Perimeter \\ \hline Disk of radius R & πR^2 & $2\pi R$ \\ \hline Rectangle of sides L_1 and L_2 & L_1L_2 & $2(L_1+L_2)$ \\ \cline{1-1} Square of side $L_1=L_2$ & & \\ \hline Right triangle, base b and height h & $\frac{1}{2}bh$ & $b+h+\sqrt{b^2+h^2}$ \\ \hline \end{tabular} \end{center}$

```
\begin{center}
\begin{tabular}{|p{2in}|c|c|}
Shape&Area&Perimeter\\
\hline\hline
Disk of radius  $R$  &  $\pi R^2$  &  $2\pi R$ \\
\hline
Rectangle of sides  $L_1$  and  $L_2$  &  $L_1L_2$  &  $2(L_1+L_2)$ \\
\cline{1-1}
Square of side  $L_1=L_2$  & & \\
\hline
Right triangle, base  $b$  and height  $h$  &  $\frac{1}{2}bh$  &  $b+h+\sqrt{b^2+h^2}$ 
\end{tabular}
\end{center}
```

Exercise 6: $\begin{center} \begin{tabular}{|l|r@{\sim}l|} \hline $a x^2 + y$ & 30 \\ \hline $b \sin(\theta) + \cos \varphi$ \\ \hline $c \cup p$ & $q \cap p$ \\ \hline \end{tabular} \end{center}$

```
\begin{center}
\begin{tabular}{|l|r@{\sim}l|}
\hline
 $a x^2 + y$  &  $30$  \\
\hline
 $b \sin(\theta) + \cos \varphi$  \\
\hline
 $c \cup p$  &  $q \cap p$  \\
\hline
\end{tabular}
\end{center}
```

Exercises (May 23, 2018):

1. Experiments:

- (a) Paste a lot of text into your document, enough for a couple of pages of typeset material, at least 6 good paragraphs. (*Hint*: Find one good paragraph, copy it into the buffer, and paste it many times into your document).

Then insert your *Dream Team Table* between paragraphs 2 and 3. Include a caption with a `\label{dreamteam}` (you provide the text). Insert `\ref{dreamteam}` somewhere in the text before and again after where you inserted the table.

Typeset once with each of positioning `b`, `t` and `h`.

- (b) Copy the table and caption and paste into the space between paragraphs 4 and 5. Typeset. Check console (warning on repeated labels).

Change label of second table: `\label{dreamteam2}`. Insert a few `\ref{dreamteam2}` somewhere in the text before and again after where you inserted the table.

2. Resize and crop the triton image to get this:



3. *Experiment* with images just as you did with tables above, and with both tables and figures in the same document. Download additional figures from the web.

Solutions

Exercise 1: Make sure you leave a blank line between paragraphs!

Exercise 2:

```
\begin{center}
\includegraphics[width=3cm,trim= 7cm 6cm 8cm 1cm,clip]{gl-5-triton.png}+
\end{center}
```


Exercises (June 6, 2018):

1. Typeset the following (note the spacing between text and math expressions and the spacing in the exponent!):

We like this: $\left(\frac{1}{2}\right)^2$ better than this: $\left(\frac{1}{2}\right)^2$

2. Typeset this definition:

$$\int_0^\infty f(x) dx \equiv \lim_{t \rightarrow \infty} \int_0^t f(x) dx$$

3. Typeset this equation:

$$\sqrt[n]{x^{1/n}} = (\sqrt[n]{x})^{\frac{1}{n}} = x^{1/n^2}$$

4. Typeset:

$$|\vec{a} + \vec{b}|^2 = \vec{a} \cdot \vec{a} + 2\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{b}$$

Solutions

Exercise 1: \[

\text{We like this:} \quad \left(\frac{1}{2} \right)^{\!\!\!2}

\quad \text{better than this:} \quad

\left(\frac{1}{2} \right)^{2}

\]

Exercise 2: \[

\int_0^{\infty} \!\!\! f(x) \, dx \equiv

\lim_{t \to \infty} \int_0^t \!\!\! f(x) \, dx

\]

Exercise 3: \[

\sqrt[n]{x^{\{1/n\}}} = (\sqrt[n]{x})^{\{1/n\}} = x^{\{1/n^2\}}

\]

Exercise 4: \[

|\vec{a} + \vec{b}|^2 =

\vec{a} \cdot \vec{a} + 2\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{b}

\]