Collection of Symbols for Cut and Paste PhL 12.11.05

For more complete descriptions of the EQ field codes, see document "field codes.doc".

$\Rightarrow$ $\nRightarrow$ $\Leftrightarrow$ $\nRightarrow$ $\nLeftrightarrow$ $\mathbf{a \bullet b}$ $a \bullet b$ $\frac{\partial(u,v)}{\partial(x,y)}$

Cut, paste and modify is the way to go. Select item, open with F4, edit, close with F4.
For large matrices, the equation editor is better. Nesting is allowed. See examples at the end.

$\otimes$ $\int dx\, f(x)$ $\int_{-\pi}^{\pi} dx\, f(x)$ $\int_0^\infty$ $\int_a^b$ $\int_{-\infty}^{\infty}$ $P_\ell^m(\rho r)$ $\binom{6}{2}$ $\oint$ $\fint$

∞ Verd

$\frac{1}{4\pi\varepsilon} \int_{C_1} \rho_1(\mathbf{x}')$ $\Sigma_{n=0}^{\infty}$

1. Integral sign: Σ $\int$ $\int_a^b$ $\int_a^b f(x)\,dx$ $\sum_{n=0}^{3}$ $\prod_{n=0}^{3}$ $\sum_{n=0}^{3}$ $\int$

A^{b_1} A_{b_1} $e^{-E_1 t}$ $e^{-\lambda_i t}$ $e^{-ax^2/2}$ $e^{i\sqrt{\lambda} r}$ $e^{-i\omega t_1}$ $e^{im\omega_1 t}$

$\sum_{m \neq n}$ $\sum_{m=-\infty}^{\infty}$ $\sum_{n=-\infty}^{\infty}$ $\int_{-\infty}^{\infty}$ $\sum_{m=1}^{\infty}$ $\sum_{m \neq 0}$ $\sum_{\mathbf{m}=-\infty}^{\infty}$ $\sum_{m=-\infty}^{\infty}$

This is a nice inline integral $\int f(x)dx$ or $\int dx\, f(x)$ that we can use anywhere without adding much line height.
Here is a line with normal height, $\overline{\text{over}}$ $\overline{X}$ $\overline{A}$ $\overline{A}$ $\overline{R_A}$ $\overline{<a,b>}$ if you need comma ø Ø

$\sum_{n=0}^{3}$ $\int f(x)\,dx$ $\int a$ $\int_{-\infty}^{\infty} f(x)dx$ $\Big|_b^a$ $\frac{\partial x^{\mathbf{a}}}{\partial y^{\mathbf{b}}}$

$\blacktriangle^{\dagger}$ $\perp$ $\oplus \supset \cap \cup \supseteq \not\subset \subset \subseteq \in \notin \ni \exists \forall \nRightarrow$ A $\propto \wedge$ $\mathbb{I}$ ✓ $\perp$ ϵ = do not use!

2. Unit vectors: $\hat{\mathbf{r}}$ $\hat{\mathbf{r}}_a$ $\hat{\boldsymbol{\varepsilon}}_t$ $\hat{\boldsymbol{\varepsilon}}_1$ $\tilde{\mathbf{r}}$

$\hat{\boldsymbol{\varepsilon}}_2$ $\hat{\boldsymbol{\phi}}$ $\hat{\mathbf{n}}$ $\hat{\boldsymbol{\theta}}$ $\hat{x}$ $\not{p}$ $\not{A}$ $\oint dx$

3. Fractions: $\frac{a}{b}$ $\left|\frac{a}{b}\right|$ $\frac{\partial a}{\partial b}$ $\frac{e^{i\mathbf{k}\bullet\mathbf{r}}}{r}$ $\frac{e^{ikR}}{R}$ $\frac{\exp(ikR)}{R}$ $\sqrt{\frac{a}{b}}$ $\begin{Bmatrix} a \\ b \\ c \end{Bmatrix}$ R

4. exponentials: $e^{i\mathbf{k}\bullet\mathbf{r}}$ e^{ikR} $e^{i(\mathbf{k}\bullet\mathbf{r} - \omega t)}$ $e^{i\omega t}$

4a. better versions: $e^{i\omega t}$ // here you can set the superscript text size as you like

5. Square roots, matrix, det: $\sqrt{a}$ $\sqrt{2}$ $\sqrt{\mu\varepsilon}$ $\begin{matrix} a \\ b \end{matrix}$ $\begin{pmatrix} a \\ b \end{pmatrix}$ $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ $\begin{Bmatrix} \text{hello} \\ \text{bob} \end{Bmatrix}$ $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$

$\begin{pmatrix} a & a \\ b & b \end{pmatrix}$ $\begin{pmatrix} a & a & a \\ b & b & b \\ c & c & c \end{pmatrix}$ $\frac{\partial x^a}{\partial x^b}$ $\begin{bmatrix} a \\ b \end{bmatrix}$ $\begin{Bmatrix} a \\ b \end{Bmatrix}$ $\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$ $\begin{pmatrix} a & a & a & a \\ b & b & b & b \\ c & c & c & c \end{pmatrix}$

$\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$ $\underline{/4ac-b^2}$

$\begin{pmatrix} a_1 & b_1 & \ldots & q_1 \\ a_2 & b_2 & \ldots & q_2 \\ \ldots & \ldots & \ldots & \ldots \\ a_N & b_N & \ldots & q_N \end{pmatrix}$ $\begin{pmatrix} a & a \\ b & b \\ c & c \end{pmatrix}$ $\begin{pmatrix} a \\ b \\ c \end{pmatrix}$ $\boldsymbol{1} = |\mathbf{e_i}><\mathbf{e_i}|$

6. Time derivatives: $\dot{\mathbf{r}}$ $\ddot{\mathbf{r}}$ $\dot{x}$ $\ddot{r}$ $\dot{\mathbf{A}}$ $\ddot{A}$ $\not{p}$ □ $\hat{\mathbf{x}}$ $\not\Rightarrow$
(caps have higher dots)

7. Other: □ $\vec{\mathbf{H}}$ $\overleftrightarrow{\mathbf{T}}$ $\vec{\mathbf{h}}$ $\mathscr{P}$ $\mp$ $a \gtrless b$ $\hbar$ $\lambda\!\!\!^{-}$ $\bar{A}$ $\bar{x}$ $A^\dagger$ $A^\perp$ $\hat{\mathbf{x}}$ $\hat{\mathbf{y}}$ $\hat{\mathbf{z}}$ ↓ ↑

$a \lesssim b$

word $e^{ia_1e^x}$ word $e^{\mp a}$ $\bar{g}$ (overbar works in PDF)

$\boldsymbol{v}\mathbf{V}$ $\boldsymbol{v}$

Ē // this uses a special font ~ that is high in the staff so the charcter does not use extra height.

$\begin{Bmatrix} a \\ bb \\ cccc \end{Bmatrix}$ { **EQ \B\lc\{\rc (\s(**a,bb,cccc))} // simpler way

exp = $\int_0^3 dx\, f(x)$ { EQ \s\up4(\i \fc\∫ \in(0,3,))} **USE THIS!!!**

$\left(\frac{\partial E}{\partial S}\right)_V$ $J_{\sqrt{2}}(x)$

$r^{-\sqrt{m^2+1}}(x)$

8. Using the **ADVANCE control**. To see all the advance fields, select the whole object below and hit the F4 key. Sometimes otherwise you don't get to see ALL the advance fields. You have to adjust the left-shift of the lower characters depending on how many you want to put there. Don't forget the final adjust on exit to get the line back to the right vertical level.

$h^{(1)}_{\ell}(kr)$

This is an in-line $\mathbf{M}^{(1)}_{e\ell n}(x,y,z)$ and here we continue the text.

$\mathbf{M}^{(1)}_{o1x}$ mmmmmmXXX,X,X)

The ADVANCE basically moves the point of entry of the next character you will type to some arbitrary location in two dimensions! You can $h^{(1)}_{\ell}(kr)$ move it up, or up and to the left, or whatever you want. Here I typed in a fancy thing just to show that ADVANCE does affect the spacing between the rows of text. This row is back to normal spacing, for example.

Better version of the above hankel: These use the stacker function of the S command, see doc.

$h^{(1)}_{\ell}(kr)$ h{EQ \s((1), ℓ)}(kr)

$P^{m}_{\ell}(\rho r)$ // associated legendre function

General Notes

The small help you get from the EQ field insertion does not tell the whole story, you have to look up Help on eq and you will get much more detail. For example, the \I field not only makes integral signs, but summation and anything else you might want. Here is the help on \I:

\I command

Integral: \i(,,)

Creates an integral (or sum, etc), using the specified symbol or default symbol and three elements. The first element is the lower limit, the second is the upper limit, and the third is the integrand. You can use the options listed in the following table to modify the \i switch.

Option Description

\su Changes the symbol to a capital **sigma** and creates a summation.

\fc\c Substitutes a fixed-height character specified by c for the symbol.

\pr Changes the symbol to a capital **pi** and creates a product.

\in Creates the **inline format** with the limits displayed to the right of the symbol instead of above and below it.

\vc\c Substitutes a variable-height character specified by c for the symbol. The symbol matches the height of the third element.
Examples:

$$\sum_{n=0}^{3} \qquad \sum_{n=0}^{3} k \qquad \prod_{n=0}^{3} \qquad \sum_{n=0}^{3}$$

$$\sum_{n=0}^{3} \quad k_{n=0}^{3} \quad \prod_{n=0}^{3} \quad \sum_{n=0}^{3}$$

$$\int_{0}^{3} dx \qquad \int_{0}^{3} dx \qquad d \qquad \int_{n=0}^{3} dx \qquad dddd \int_{0}^{3} dx$$

$$\int_{0}^{3} \quad \int_{0}^{3} \quad \int_{n=0}^{3} \quad dfff \int_{0}^{3} \quad ffff$$

my own int symbol

In these examples, you **have to** at least have a space in the third argument to get it to work.

Subscripts and Superscripts

Superscript or Subscript: \s()

Places an element or elements as superscript or subscript characters. Each \s code can have one or more elements; separate the elements with commas. If more than one element is specified, the elements are stacked and left-aligned. You can use the options listed in the following table to place single elements after the \s switch.

a
b
c

Option Does this

\ain () Adds space above a line in a paragraph by the number of points specified by n.

\upn () Moves a single element above the adjacent text by the number of points specified by n. The default is 2 points.

\din () Adds space below a line in a paragraph by the number of points specified by n.

\don () Moves a single element below the adjacent text by the number of points specified by n. The default is 2 points.

{ EQ \s\up8(UB)\s\do8(2) } displays: ssss $^{UB}_{2}$

Examples

$$\int_{-\infty}^{\infty} dx\ \exp[\ -(\ ax^2 + bx + c)\ ] \ = \ \sqrt{\frac{\pi}{a}}\ \exp[\ (b^2/4a) - c\ ] \qquad \int_{-\infty}^{\infty} dx\ e^{ikx} \ = 2\pi\delta(k)$$

Better method for the above LHS: $\int_{-\infty}^{\infty} dx\ \exp[\ -(ax^2 + bx + c)\ ]$

$$\sum_{n=-N}^{N} e^{ink} \ = \ 2\pi\ \{\ \frac{\sin[(N+1/2)k]}{2\pi \sin(k/2)}\ \}$$

$$\mathrm{Re}[X(\omega)] = \mathrm{Re}[X(\infty)] + (1/\pi) \int_{-\infty}^{\infty} d\omega' \frac{\mathrm{Im}[X(\omega')]}{\omega' - \omega} \qquad (5.3a)$$

Hilbert Transform

$$\mathrm{Im}[X(\omega)] = \mathrm{Im}[X(\infty)] - (1/\pi) \int_{-\infty}^{\infty} d\omega' \frac{\mathrm{Re}[X(\omega')]}{\omega' - \omega} \qquad (5.3b)$$

$$\frac{\langle |X(\omega)|^2 \rangle}{T} \ = \ \frac{|X_{pulse}(\omega)|^2}{T_1}\ \{\ (\beta-\alpha)\ +\ \alpha \sum_{m=-\infty}^{\infty} 2\pi\delta(\omega T_1 - 2\pi m)\ \} \qquad (6.4.7)$$

$$\mathbf{E}_{inc} = (1/2)\Sigma\ i^{\ell} \sqrt{4\pi(2\ell+1)}\ [\ 2j_{\ell}(k_1 r)\ \mathbf{X}_{\ell,\pm 1}\ \pm 2/k_1\ \nabla \times \{\ j_{\ell}(k_1 r)\ \mathbf{X}_{\ell,\pm 1}\}\ ]$$

$$\int d\Omega\ \hat{\mathbf{r}}\ Y_{\ell' m'}^{*}(\theta,\phi) \bullet \hat{\mathbf{r}}\ Y_{\ell m}(\theta,\phi) = \int d\Omega\ Y_{\ell' m'}^{*}(\theta,\phi)\ Y_{\ell m}(\theta,\phi) = \delta_{\ell',\ell}\ \delta_{m',m}$$

$$\int d\Omega\ \mathbf{L} Y_{\ell' m'}^{*}(\theta,\phi) \bullet \mathbf{L}\ Y_{\ell m}^{*}(\theta,\phi) = \int d\Omega\ \langle \ell' m' |\boldsymbol{\mathcal{L}}| \theta\phi \rangle \bullet \langle \theta\phi |\boldsymbol{\mathcal{L}}|\ \ell m \rangle = \langle \ell' m' |\boldsymbol{\mathcal{L}} \bullet \boldsymbol{\mathcal{L}}|\ \ell \boldsymbol{m} \rangle$$

$$= \langle \ell' m' |\boldsymbol{\mathcal{L}}^2|\ \ell \boldsymbol{m} \rangle = \ell(\ell+1) \langle \ell' m' |\ \ell \boldsymbol{m} \rangle = \ \ell(\ell+1)\ \delta_{\ell',\ell}\ \delta_{m',m}$$

$\mathbf{M_{o1\ell}} \equiv j_\ell(kr)\ \mathbf{r} \times \nabla\psi_{o1\ell}$ where $\psi_{o1\ell} \equiv P_\ell^1(\cos\theta)\sin\phi$

$$\begin{pmatrix} 1 & 0 & 0 \\ \alpha & 1 & 0 \\ \beta & 0 & 1 \end{pmatrix}\begin{pmatrix} \mathbf{r1} \\ \mathbf{r2} \\ \mathbf{r3} \end{pmatrix} = \begin{pmatrix} \mathbf{r1} \\ \mathbf{r2} + \alpha * \mathbf{r1} \\ \mathbf{r3} + \beta * \mathbf{r1} \end{pmatrix} = \begin{pmatrix} \mathbf{r1} \\ \mathbf{r2'} \\ \mathbf{r3'} \end{pmatrix}$$

linearly independent by theorem above, and we create a similarity matrix using these eigenvectors:

$B = \begin{pmatrix} \lambda_1 & a \\ 0 & \lambda_2 \end{pmatrix}$, eigenvectors are: $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$ for λ_1 and $\begin{pmatrix} \alpha_a \\ 1 \end{pmatrix}$ for λ_2 where $\alpha_a = a/(\lambda_2 - \lambda_1)$.

By doing a similarity with $S = \begin{pmatrix} 1 & \alpha_a \\ 0 & 1 \end{pmatrix}$ [inverse $\begin{pmatrix} 1 & -\alpha_a \\ 0 & 1 \end{pmatrix}$], we get $S^{-1} B S = \begin{pmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{pmatrix}$. Note that the similarity here is NOT unitary because the columns are not orthogonal. This example shows that in

$$A = \begin{pmatrix} 1 & a & b \\ 0 & 1 & c \\ 0 & 0 & 1 \end{pmatrix} \quad \text{and } A - \lambda E = \begin{pmatrix} 1-\lambda & a & b \\ 0 & 1-\lambda & c \\ 0 & 0 & 1-\lambda \end{pmatrix} \text{ secular says } (1-\lambda)^3 = 0 \text{ so } \lambda = 1 \text{ triple}$$

$\det(A) = \varepsilon_{i_1 i_2 i_3 \ldots . i_n} A_{1 i_1} A_{2 i_2} A_{3 i_2} A_{4 i_3} \ldots . A_{n i_n}$

$q_k = \varepsilon_{k i_1 i_2 i_3 \ldots . i_{N-1}} a^{(1)}{}_{i_1} a^{(2)}{}_{i_2} \ldots . a^{(N-1)}{}_{i_N}$

$X^{i_{k+1}}$ = subscript 1 on a subscript k of a superscript

A^{b_1} $e^{-E_1 t}$ $e^{-\lambda_i t}$ $e^{-ax^2/2}$ $e^{-ax^2/2}$ $e^{-\omega_1 t}$

$\int_a^b f(x)\,dx$ has advance fields

ψ

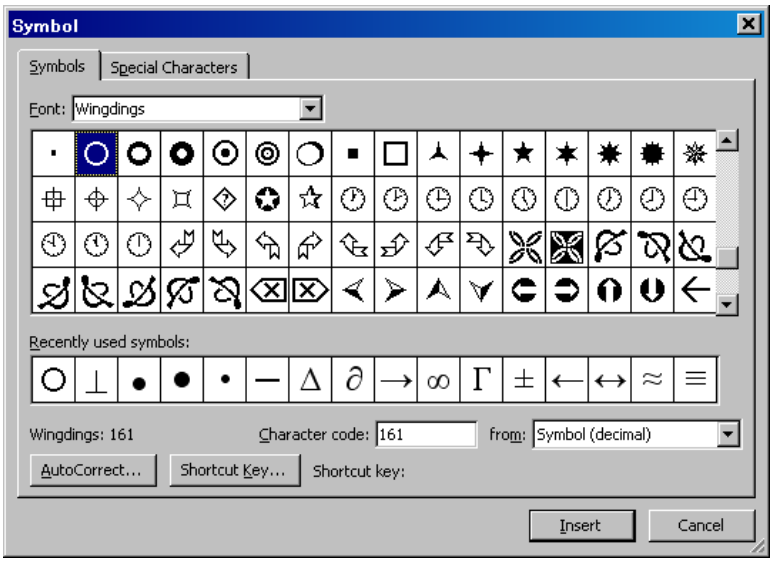
The previous ψ is an example of something shifted "up" a lot, use to the right of pasted pictures to label the picture on the right side.

Moving characters left and right: Here is an example of how you can move in both directions at the same time

∮ gives ∮ ∮

Here I wanted a line integral. I select a circle from wingdings, size it, and, doing the overtype, I shift it both up and back. The codes are up and do for up and down with the \s switch, and fo and ba for forward and back with the\d\ switch. By nesting things, you can the ○ to be right where you want it on the integral sign.

This circle thing is from here: [letter O and o did not look right since not round!]



It seems to be saying this is character 161 from the Wingdings font, but when you select the character in a doc, Word does not reveal this fact!

Question: Where is "help" for all the field Eq options? I don't see them in the Insert Field dialog. Microsoft likes to hide this I think, go to this location

http://office.microsoft.com/en-us/word/HP051861481033.aspx

and you get some information. It seems to indicate that you can only move an integral number of points with the displace d switch, for example.

Spinor dots: $X^{\dot{a}\dot{b}}$ just use the already-existing dot mechanism!

subscript on subscript or on superscript A_{n_1} A^{n_1}

Added the following info on 2/28/15: Non-Square Matrices using Field Codes

Start with this object

$$\begin{bmatrix} a \\ b \end{bmatrix} \qquad \begin{bmatrix} a \\ b \end{bmatrix} \tag{1}$$

where I have gotten the letters a and b left-right centered. Now you can replace the [character in the field code with a space so the above then becomes

$$\begin{matrix} a \\ b \end{matrix} \qquad \begin{matrix} a \\ b \end{matrix} \tag{2}$$

Next, suppose we want a matrix with 2 rows and 3 columns. Start item (1) with b removed,

[a] [a] (3)

where I again tuned to get good left right spacing. Now replace the argument of A with a set of objects NOT separated by commas, for example

[a b c] [a b c] (4)

Now replace the three letters a,b,c here with item (2) objects

$$\begin{bmatrix} a & a & a \\ b & b & b \end{bmatrix} \quad (5)$$

I think this is the first time I have ever made a non-square matrix with field codes. I could of course replace the brackets with other characters,

$$\begin{vmatrix} a & a & a \\ b & b & b \end{vmatrix} \qquad \begin{Bmatrix} a & a & a \\ b & b & b \end{Bmatrix} \quad (6)$$

Now if we want more columns, they are each to add starting with (5)

$$\begin{bmatrix} a & a & a & a & a & a \\ b & b & b & b & b & b \end{bmatrix} \quad (7)$$

where I keep tuning the spacing to get something nice.

Suppose we want more rows? We can make new versions of (1) and (2)

$$\begin{bmatrix} a \\ b \\ c \end{bmatrix} \qquad \begin{bmatrix} a \\ b \\ c \end{bmatrix} \quad (8)$$

a a
b b (9)
c c

Then item 9 can be installed into (7) and voila :

$$\begin{bmatrix} a & a & a & a & a & a \\ b & b & b & b & b & b \\ c & c & c & c & c & c \end{bmatrix} \quad \text{or} \quad \begin{bmatrix} a & a \\ b & b \\ c & c \end{bmatrix}$$

The columns are spaced far apart because we have to have those "spaces" replacing the brackets, but the result is at least usable. One can make matrices of any size using this method.