Formulas

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```
\usepackage{amsmath,amssymb}
\usepackage{commath,mathtools}
```

Formulas: The basics

Formula	Code	Formula	Code
$\sqrt{2}$	`$ $`	$\sqrt[3]{8}$	`$ $`
$\frac{2}{3}$	`$ $`	x_1	`$ $`
$6 \geq 3$	`$ $`	x_1^2	`$ $`
$a^2 + b^2$	`$ $`	a^{2+b^2}	`$ $`

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`$ x^22 $`: x^22

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$a^2 + b^2$	`$ a^2 + b^2 $`	a^{2+b^2}	`$ a^{2 + b^2} $`

`$ x^22 $`: x^22 | `$ x^{22} $`: x^{22}

Formulas: Symbols

Formula	Code	Formula	Code
$x_1, \ldots, x_n$	$ $	$5 \cdot 6$	$ $
α, β, γ	$ $	A, B, Γ	$ $
ϵ, ε	$ $	$\mathcal{P}$	$ $
ϕ, φ	$ $	$\mathbb{P}$	$ $

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α, β, γ	`$ $`	A, B, Γ	`$ $`
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α, β, γ	`$ \alpha,\beta,\gamma $`	A, B, Γ	`$ $`
ϵ, ε	`$ \epsilon,\varepsilon $`	$\mathcal{P}$	`$ $`
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α,β,γ	`$ \alpha,\beta,\gamma $`	A, B, Γ	`$ $`
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α, β, γ	`$ \alpha,\beta,\gamma $`	A, B, Γ	`$ $`
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α,β,γ	`$ \alpha,\beta,\gamma $`	A,B,Γ	`$ A,B,\Gamma $`
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$x_1, \dots, x_n$	`$ x_1,\dots,x_n $`	$5 \cdot 6$	`$ 5\cdot 6 $`
α, β, γ	`$ \alpha,\beta,\gamma $`	A, B, Γ	`$ A,B,\Gamma $`
ϵ, ε	`$ \epsilon,\varepsilon $`	$\mathcal{P}$	`$ \mathcal{P} $`
ϕ, φ	`$ \phi,\varphi $`	$\mathbb{P}$	`$ $`

Formulas: Symbols

Formula	Code	Formula	Code
$x_1,\dots,x_n$	`$ x_1,\dots,x_n $`	$5\cdot 6$	`$ 5\cdot 6 $`
α,β,γ	`$ \alpha,\beta,\gamma $`	A,B,Γ	`$ A,B,\Gamma $`
ϵ,ε	`$ \epsilon,\varepsilon $`	$\mathcal{P}$	`$ \mathcal{P} $`
ϕ,φ	`$ \phi,\varphi $`	$\mathbb{P}$	`$ \mathbb{P} $`

Formulas: Vectors

Formule	Code	Formule	Code
$\vec{x}$	`$ \vec{x} $`	$\vec{F}_{\text{tot}}$	`$ \vec{F}_{\text{tot}} $`
$\mathbf{x}$	`$ \mathbf{x} $`	$\hat{\imath} + 6\,\hat{k}$	`$ \hat{\imath} + 6\,\hat{k} $`
$\|\vec{x}\|$	`$ \norm{\vec{x}} $`	$\nabla \times \mathbf{A}$	`$ \nabla\times\mathbf{A} $`

$$\vec{F}_{tot}, \ \vec{F}_{\text{tot}}$$

Formulas: Calculus

```
\usepackage{commath}
```

```
\dod{\sin(x)}{x}, \dpd{f(x,y)}{x}, \partial_x f

\int_{0}^{\infty}e^{-x}\dif x = 1
```

$$\frac{\mathrm{d}\sin(x)}{\mathrm{d}x}, \frac{\partial f(x,y)}{\partial x}, \partial_x f$$

$$\int_0^\infty e^{-x}\,\mathrm{d}x = 1$$

Formulas: Mathematical relations

Formula	Code	Formula	Code
$a \leq b$	`$ a \leq b $`	$a \geq b$	`$ a \geq b $`
$a < b$	`$ a < b $`	$a > b$	`$ a > b $`
$a \ll b$	`$ a \ll b $`	$a \gg b$	`$ a \gg b $`
$a = b$	`$ a = b $`	$a \simeq b$	`$ a \simeq b $`
$a \neq b$	`$ a \neq b $`	$a \approx b$	`$ a \approx b $`
$a \sim b$	`$ a \sim b $`	$a \stackrel{*}{=} b$	`$ a \stackrel{*}{=}b $`

Formulas: Arrows and operators

```
\DeclareMathOperator{\Image}{Image}

a \iff b, a\implies b, a\mapsto b
\lim_{x\to 0}\frac{\sin(x)}{x} = 1
\Image(f) = \mathbb{R}_{\geq 0}
```

$$a \iff b, a\implies b, a\mapsto b$$

$$\lim_{x\to 0}\frac{\sin(x)}{x} = 1$$

$$\operatorname{Image}(f) = \mathbb{R}_{\geq 0}$$

So many! And there are lots more :-)

CTAN symbol list:
http://mirrors.ctan.org/info/symbols/comprehensive/symbols-a4.pdf

Detexify:
http://detexify.kirelabs.org/classify.html

Equation

```
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\end{equation}
```

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$$\sin^2(\theta) + \cos^2(\theta) = 1. \tag{1}$$

Align

```
The double-angle formula can now be rewritten as
\begin{align}
    \cos(2\theta) = \cos^2(\theta) - \sin^2(\theta)\\
    = 2\cos^2(\theta)-1.
\end{align}
```

The double-angle formula can now be rewritten as

$$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta) \tag{1}$$

$$= 2\cos^2(\theta) - 1. \tag{2}$$

Align

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The double-angle formula can now be rewritten as
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    \cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta)\\
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$$\begin{align}\cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta) \\ &= 2\cos^2(\theta) - 1.\end{align}$$

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```

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$$\begin{aligned} \cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta) \\ &= 2\cos^2(\theta) - 1. \qquad (1) \end{aligned}$$

Align

```latex
The double-angle formula can now be rewritten as
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```

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\end{align*}
```

The double-angle formula can now be rewritten as

$$\begin{aligned} \cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta) \\ &= 2\cos^2(\theta) - 1. \end{aligned} \tag{$*$}$$

Align

```
We do this with the double-angle formula
\begin{align*}
    \cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta),
\end{align*}
which we can rewrite as
\begin{align*}
    &= \cos^2(\theta) - (1 - \cos^2(\theta))\\
    &= 2\cos^2(\theta)-1.
\end{align*}
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which we can rewrite as

$$\begin{aligned} &= \cos^2(\theta) - (1 - \cos^2(\theta)) \\ &= 2\cos^2(\theta) - 1. \end{aligned}$$

Also in use

```
AA \(\sqrt{2}\)
BB \[\sqrt{3}\]
CC $$ \sqrt{4} $$
```

AA $\sqrt{2}$ BB

$$\sqrt{3}$$

CC

$$\sqrt{4}$$

Left-right

```
\begin{align*}
    &f(\sum_{i=1}^{n}x_i)\\
    &f\left(\sum_{i=1}^{n}x_i\right)
\end{align*}
```

$$
\begin{aligned}
&f(\sum_{i=1}^{n}x_i)\\
&f\left(\sum_{i=1}^{n}x_i\right)
\end{aligned}
$$

Delimiter point

```
\begin{align*}
    \left.\left[x^2\right]\right|_{x=0}^{x=2} = 4
\end{align*}
```

$$\left.\left[x^2\right]\right|_{x=0}^{x=2} = 4,$$

```latex
\begin{align*}
    R(\theta) = \begin{pmatrix}
        \cos(\theta) & -\sin(\theta)\\
        \sin(\theta) & \cos(\theta)
    \end{pmatrix},\quad
    \abs{x} = \begin{cases}
        x & \mbox{if $ x \geq 0$}\\
        -x & \mbox{if $ x < 0$}
    \end{cases}
\end{align*}
```

$$R(\theta) = \begin{pmatrix} \cos(\theta) & -\sin(\theta) \\ \sin(\theta) & \cos(\theta) \end{pmatrix}, \quad |x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$