\documentclass{article}

\usepackage{amsmath}

\usepackage{esint}

\usepackage{mathtools}

\usepackage{amssymb}

\begin{document}

\Large

\begin{align\*}

1\_A = \left\{ \begin{array}{rcl} {1} & \mbox{if} & x \in A \\ 0 & \mbox{if} & x \notin A \end{array}\right

\end{align\*}

\begin{align\*}

n\underbrace{\uparrow\dots\uparrow }\_{n}n = n \rightarrow n \rightarrow n

\end{align\*}

\begin{align\*}

&1\uparrow 1 = {^1}{1} = 1\\

&2 \uparrow \uparrow 2 = {^2}{2} = 4\\

&3 \uparrow\uparrow\uparrow 3 = {^{{^3}{3}}}{3} = 3 \uparrow \uparrow 3\uparrow \uparrow3 = \underbrace{3^{3^{3^{3^{\cdot^{\cdot^{\cdot^3}}}}}}}\_{3^{3^{3}} threes}

\end{align\*}

\begin{align\*}

\frac{d}{dx}f(x)= \lim\_{\bigtriangleup x \to 0}\frac{f(x+\bigtriangleup x)-f(x)}{\bigtriangleup x}

\end{align\*}

\begin{align\*}

H\_2O(\ell) + H\_2O(\ell) \rightleftharpoons H\_3O^{+}(aq) + OH^{-}(aq)

\end{align\*}

\begin{align\*}

\Gamma(n+1) \stackrel{\text{def}}{=} \int\_{o}^{\infty} \exp^{-t} t^{n} dt

\end{align\*}

\begin{align\*}

\gcd(n, m \mod n); \quad x \equiv y \pmod{b}; \quad x \equiv y \mod c; \quad x \equiv y (d)

\end{align\*}

\begin{align\*}

&\nabla \cdot \boldsymbol{E} = \frac{\rho}{\varepsilon\_0}\\

&\nabla \cdot \boldsymbol{B} = 0\\

&\nabla\times \boldsymbol{E} = -\frac{\partial\boldsymbol{B}}{\partical t}\\

&\nabla\times \boldsymbol{B} = \mu\_0\boldsymbol{J} +\mu\_0\varepsilon\_0\frac{\partial\boldsymbol{E}}{\partial t}

\end{align\*}

\begin{align\*}

&\oiint\_{\partial V} \boldsymbol{E} \cdot d\boldsymbol{A} = \frac{Q(V)}{\varepsilon\_0}\\

&\oiint\_{\partial V} \boldsymbol{B} \cdot d\boldsymbol{A} = 0\\

&\oint\_{\partial s} \boldsymbol{E} \cdot d\boldsymbol{I} = -\frac{\partial \Phi\_{B,S}}{\partial t}\\

&\oint\_{\partial S} \boldsymbol{B} \cdot d\boldsymbol{I} = \mu\_0 I\_S + \mu\_0 \varepsilon\_0 \frac{\partial \Phi\_{E,S}}{\partial t}\\

\end{align\*}

\begin{align\*}

\rho\_0 = \left( \begin{array}{cc} \cos\theta & \sin\theta \\

-\sin\theta & \cos\theta \end{array} \right) = \left[ \begin{array}{cc}

\cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{array} \right]\\

\end{align\*}

\begin{align\*}

\left[ \begin{array}{c|ccc}

1 & 0 & \dots & 0\\ \hline 0& \* & \dots & \* \\ \vdots & \vdots & \ddots & \vdots \\ 0& \*& \dots&\*\end{array} \right] = \begin{tabular}{|c|ccc|}\hline 1 & 0 & \dots & 0\\ \hline 0& \* & \dots & \* \\ \vdots & \vdots & \ddots & \vdots \\ 0& \*& \dots & \* \\ \hline\end{tabular}\\

\end{align\*}

\begin{align\*}

&\sigma = \sqrt{\frac{1}{N}\sum\_{i=1}^{N}p\_i(x\_i - \={x})^{2}} = \sqrt{\frac{\sum\_{i=1}^{N}p\_i(x\_i - \={x})^{2}}{N}}\\

&\varphi(n) = n \cdot \prod\_{\underset{p prime}{p|n}} \left(1-\frac{1}{p}\right)\\

\end{align\*}

\begin{align\*}

^4\_{12}C^{5+}\_2 \quad ^{14}\_{2}C^{5+}\_{2} \quad ^{4}\_{12}C^{5+}\_{2} \quad ^{14}C^{5+}\_{2} \quad {2}C^{5+}\_{2}

\end{align\*}

\begin{align\*}

\mathbb{Q} \cong \left\{ \begin{array}{rcl}

\frac{a}{b} | \, a,b \, \in \, \mathbb{Z} \, and \, b \neq 0

\end{array}\right\}

\end{align\*}

\begin{align\*}

\frac{a}{b} \sim \frac{c}{d} \, \Longleftrightarrow \, ad -bc = 0

\end{align\*}

\end{document}