

Packages Used

```
\usepackage{latexsym,mathrsfs}
\usepackage{amssymb,amsfonts,amsmath,yhmath}
\usepackage{tikz}
```

Math Mode

```
\(...\) - Inline      \[... \] - Displayed
```

Non-Math Symbols

```
- -            % \%            "... " ``\ldots''
- --          # \#            § \S
— ---        { } \{ \}        ¶ \P
$ \$          - \_            © \copyright
& \&        '...' '\ldots'    ™ \texttrademark
```

Binary Operators

```
± \pm            ∪ \cup            ∆ \bigwedge
∓ \mp            ∩ \bigcap        \ \setminus
× \times        ∪ \bigcup        ⊕ \oplus
◦ \circ        ∪ \bigcup        ⊗ \otimes
• \bullet        ∨ \vee            ⊕ \bigoplus
· \cdot        ^ \wedge        ⊗ \bigotimes
∩ \cap        ∨ \bigvee        ⊗ \bigotimes
```

Relation Symbols

```
< \leq          ⊂ \subset        ∥ \parallel
≥ \geq          ⊆ \subseteq     < \triangleleft
≡ \equiv        ⊃ \supset        ≠ \neq
ℝ \cong        ⊇ \supseteq     ≠ \neq
~ \sim          ∈ \in            ∥ \not \parallel
≈ \approx        ⊥ \perp        ≠ \not <
```

Arrow Symbols

```
← \leftarrow    ↓ \downarrow
⇐ \Leftarrow    ↓ \Downarrow
↵ \hookrightarrow    ⇕ \updownarrow
→ \rightarrow    ⇕ \Updownarrow
⇒ \Rightarrow    ↗ \nearrow
↪ \hookrightarrow    ↘ \searrow
↔ \leftrightarrow    ↗ \nearrow
⇌ \leftrightharrow    ↘ \searrow
⇔ \Leftrightarrow    ↗ \nearrow
↑ \uparrow        ↦ \mapsto
⇑ \Uparrow        ↪ \mapsto
```

Operations

```
√x \sqrt{x}            a^{1-b} a^{1-b}
ⁿ√x \sqrt[n]{x}        ∑_{i=1}^n \sum_{i=1}^n
lim \lim_{\cdots}        ∏_{i=1}^n \prod_{i=1}^n
a/b \frac{a}{b}        ∫_a^b \int_a^b
\binom{a}{b} \binom{a}{b}
```

Common functions in L<sup>A</sup>T<sub>E</sub>X

```
cos \cos    sec \sec    ln \ln    min \min
sin \sin    csc \csc    log \log
tan \tan    cot \cot    max \max
```

Greek Letters

```
α \alpha    ν \nu        ψ \psi
β \beta    ξ \xi        ω \omega
γ \gamma    ο ο        Γ \Gamma
δ \delta    π \pi        Δ \Delta
ε \epsilon    ϖ \varpi    Θ \Theta
ε \varepsilon    ρ \rho        Λ \Lambda
ζ \zeta        σ \varrho     Ξ \Xi
η \eta        ρ \sigma    Π \Pi
θ \theta      ς \varsigma    Σ \Sigma
ϑ \vartheta    τ \tau        Υ \Upsilon
ι \iota        υ \upsilon     Φ \Phi
κ \kappa      φ \phi        Ψ \Psi
λ \lambda      ϕ \varphi     Ω \Omega
μ \mu        χ \chi
```

Math Accents

```
â \hat{a}            ã \tilde{a}
ã \check{a}            ā \bar{a}
ä \breve{a}            ā \vec{a}
á \acute{a}            á \dot{a}
à \grave{a}            ä \ddot{a}
```

Delimiters

```
∥ \lvert            < \langle        ] \rceil
{ \{                > \rangle        [ \lfloor
} \}                [ \lceil            ] \rfloor
```

Under - Overs

```
← a+b \overleftarrow{a+b}
→ a+b \overrightarrow{a+b}
↔ a+b \overleftrightarrow{a+b}
top a+b \stackrel{top}{\longrightarrow}
```

```
∧ a+b \widehat{a+b}    a+b \underline{a+b}
ABC \wideparen{ABC}    a+b \overbrace{a+b}
a+b \overline{a+b}    a+b \underbrace{a+b}
```

Big Left - Rights

```
{ \left(\vdots\right)    { \left\{\vdots\right.
\left\{\vdots\right\}    \left.\vdots\right\}
```

Math Spacing

```
∣ \, - Thin            ∣ \_ - Interword
∣ \: - Medium         ∥ \! - Negative
∣ \; - Thick
```

Fonts

```
Ital \textit {Ital}    Type \texttt {Type}
Bold \textbf {Bold}
```

Font Sizes

```
\tiny            \normalsize        \huge
\scriptsize     \large            \Huge
\footnotesize   \Large
\small            \LARGE
```

Math Fonts

```
Ital \mathit {Ital}    Type \mathtt {Type}
Bold \mathbf {Bold}    CAL \mathcal {CAL}
```

Miscellaneous

```
... \cdots          ∇ \forall          ♦ \diamondsuit
... \ldots          ∃ \exists          ♥ \heartsuit
: \vdots            ¬ \neg            ♠ \spadesuit
\ \backslash        \ \backslash        N \mathbb{N}
.. \ddots            ∂ \partial        Z \mathbb{Z}
ℵ \aleph            ∞ \infty        Q \mathbb{Q}
∅ \emptyset        □ \Box            R \mathbb{R}
∇ \nabla            △ \triangle     C \mathbb{C}
∠ \angle            ♣ \clubsuit     P \mathscr{P}
```

## Labeled Equation

Equation 1 is the FT of Calculus

$$f(x) = \frac{d}{dx} \int_a^x f(t) dt \quad (1)$$

Equation `\ref{eq:FTC}` is the FT of Calculus

```
\begin{equation}\label{eq:FTC}
f(x)=\frac{d}{dx}\int_a^x f(t)\, dt
\end{equation}
```

## Displayed Equations

$$\forall x \in \mathbb{R} : x^2 \geq 0$$
$$\exists x \in \mathbb{R} : x^2 \leq x$$

```
\[\forall x \in \mathbb{R} : x^2 \geq 0\]
\[\exists x \in \mathbb{R} : x^2 \leq x\]
```

## Scaling Delimiters

$$\mathbb{Q} = \left\{ \frac{a}{b} \mid a, b \in \mathbb{Z} \wedge b \neq 0 \right\}$$

*% Comments are done with %'s*

```
\[
\mathbb{Q}=\left\{
\frac{a}{b}\right\},
\middle|,
a,b \in \mathbb{Z} \wedge b \neq 0
\right\}
\]
```

## Piecewise Function

$$f(x) = \begin{cases} x^2 & x > 0 \\ -3x & x \leq 0 \end{cases}$$

*% & indicates a new column*

*% \\ is a new line*

```
\[
f(x)=\left\{
\begin{array}{cc}
x^2 & x > 0 \\
-3x & x \leq 0
\end{array}
\right.
\right.
\]
```

## Matrix

$$A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

```
\[% Try bmatrix, Bmatrix, umatrix, Vmatrix
% to get delimiters [.], {., |., ||. ||
A=\begin{pmatrix}
a & b \\
c & d
\end{pmatrix}
\]
```

## Augmented Matrix

```
\[\left[\begin{array}{rr|r}
a & b & e \\
c & d & f
\end{array}\right]\]
```

## Table

Title		
left	center	right
A	B	C

```
\begin{center}
% l,r,c align left, right, or center
\begin{tabular}{l|c|r}
\multicolumn{3}{c}{Title}\ \hline
left & center & right\ \hline
A & B & C
\end{tabular}
\end{center}
```

## Align Environment

```
\begin{align}
x^2 = 5^2 \quad (2) \qquad x^2 \quad \&= \quad 5^2 \quad \\\
= 25 \quad (3) \qquad \qquad \quad \&= \quad 25
\end{align}
```

## Itemized List and Font Sizes

```
\begin{itemize}
\item {\tiny tiny}
2. normal \item[2.] normal
\item {\large large}
\end{itemize}
```

## Enumerated List

```
\begin{enumerate}
1. First \item First
2. Second \item Second
\bullet Third \item[\bullet] Third
\end{enumerate}
```

## Over - Under Demo

$$\overbrace{x^2 + 1}^{\text{expression}} = 0$$

Equation

```
\[% \text{} types plain text in math mode
\underbrace{
\overbrace{x^2+1}^{\text{expression}}
=0
}_\text{Equation}
\]
```

## Insert an Image



```
\begin{center}
\includegraphics[width=0.75in]
{Chuck_Duck Orange Mask Pond.png}
\end{center}
```

## TikZ Picture

```
\begin{tikzpicture}[scale=0.85]
\draw[rounded corners=5pt,
color=blue,fill=yellow]
(4,0) rectangle ++(3,1)
node[pos=0.5]{test};
\draw[color=blue!50!black]
(0,0) -- (1,1) to[out=225,in=-45]
(2,1) -- (3,0) -- cycle;
\shade[ball color=red]
(0,0) circle (3pt);
\end{tikzpicture}
```