Writing Mathematical Equations in RMarkdown

Cheng Peng

STA 506 Mathematical Statistics II

Contents

1 Intorduction

This note list commands for creating mathematics formulas in RMarkdown.

2 Greek Letters

Symbol	Script
α	\alpha
A	A
β	\beta
B	B
γ	\gammma

1

Symbol	Script
Γ	\Gamma
π	\pi
Π	\Pi
ϕ	\phi
Φ	\Phi
φ	\varphi
θ	\theta

3 Operators

Symbol	Script
cos	\cos
sin	\sin
lim	\lim
exp	\exp
$\rightarrow$	\to
∞	\infty
$\equiv$	\equiv
mod	\bmod
$\times$	\times

4 Power and Indicies

Symbol	Script
k_{n+1}	k_{n+1}
n^2	n^2
k_n^2	k_n^2

5 Fractions and Binomials

Symbol	Script
$\frac{n!}{k!(n-k)!}$	\frac{n!}{k!(n-k)!}
$\binom{n}{k}$	\binom{n}{k}
$\frac{\frac{1}{k}}{x-y}$	\frac{\frac{x}{1}}{x - y}
$^3/_7$	^3/_7

6 Radical Roots

Symbol	Script
$\sqrt{k}$	\sqrt{k}
$\sqrt[n]{k}$	\sqrt[n]{k}

7 Sums, Integrals, and Related Symbols

Symbol	Script
$\sum_{i=1}^{10} t_i$	`\sum_{i=1}^{10} t_i`
$\int_0^\infty \mathrm{e}^{-x}, \mathrm{d}x$	`\int_0^\infty \mathrm{e}^{-x},\mathrm{d}x`
$\sum$	`\sum`
$\prod$	`\prod`
$\coprod$	`\coprod`
$\bigoplus$	`\bigoplus`
$\bigotimes$	`\bigotimes`
$\bigodot$	`\bigodot`
$\bigcup$	`\bigcup`
$\bigcap$	`\bigcap`
$\biguplus$	`\biguplus`
$\bigsqcup$	`\bigsqcup`
$\bigvee$	`\bigvee`
$\bigwedge$	`\bigwedge`
$\int$	`\int`
$\oint$	`\oint`
$\iint$	`\iint`
$\iiint$	`\iiint`
$\int \cdots \int$	`\idotsint`
$\sum_{0<i<m,\ 0<j<n} P(i,j)$	`\sum_{\substack{0<i<m, \ 0<j<n}} P(i, j)`
$\int\limits_a^b$	`\int\limits_a^b`

8 More Special Symbols

Symbol	Script
a'	`a^{\prime}`
a''	`a^{\prime\prime}`
$\hat{a}$	`\hat{a}`
$\bar{a}$	`\bar{a}`
$\grave{a}$	`\grave{a}`
$\acute{a}$	`\acute{a}`
$\dot{a}$	`\dot{a}`
$\ddot{a}$	`\ddot{a}`
$\not{a}$	`\not{a}`
$\mathring{a}$	`\mathring{a}`
$\overrightarrow{AB}$	`\overrightarrow{AB}`
$\overleftarrow{AB}$	`\overleftarrow{AB}`
a'''	`a^{\prime\prime\prime}`
$\overline{aaa}$	`\overline{aaa}`
$\check{a}$	`\check{a}`
$\vec{a}$	`\vec{a}`
$\underline{a}$	`\underline{a}`
$\color{red}x$	`\color{red}x`
$\pm$	`\pm`
$\mp$	`\mp`
$\int y\mathrm{d}x$	`\int y \mathrm{d}x`

Symbol	Script
,	,
⋮	⋮
;	;
!	!
$\int y, \mathrm{d}x$	\int y, \mathrm{d}x
...	\dots
...	\ldots
⋯	\cdots
⋮	\vdots
⋱	\ddots

9   Brackets

Symbol	Script
(a)	(a)
$[a]$	[a]
$\{a\}$	\{a\}
$\langle f \rangle$	\langle f \rangle
$\lfloor f \rfloor$	\lfloor f \rfloor
$\lceil f \rceil$	\lceil f \rceil
$\ulcorner f \urcorner$	\ulcorner f \urcorner

10   Matrices and System of Equations

10.1   Matrix

```
$$
X_{m,n} =
\begin{pmatrix}
  x_{1,1} & x_{1,2} & \cdots & x_{1,n} \\
  x_{2,1} & x_{2,2} & \cdots & x_{2,n} \\
  \vdots  & \vdots  & \ddots & \vdots  \\
  x_{m,1} & x_{m,2} & \cdots & x_{m,n}
\end{pmatrix}
$$
```

produces

$$
X_{m,n} =
\begin{pmatrix}
x_{1,1} & x_{1,2} & \cdots & x_{1,n} \\
x_{2,1} & x_{2,2} & \cdots & x_{2,n} \\
\vdots & \vdots & \ddots & \vdots \\
x_{m,1} & x_{m,2} & \cdots & x_{m,n}
\end{pmatrix}
$$

```
$$
M =
\begin{bmatrix}
\frac{5}{6} & \frac{1}{6} & 0 \\[0.3em]
\frac{5}{6} & 0 & \frac{1}{6} \\[0.3em]
```

```
0 & \frac{5}{6} & \frac{1}{6}
\end{bmatrix}
$$
```

produces

$$
M = \begin{bmatrix} \frac{5}{6} & \frac{1}{6} & 0 \\ \frac{5}{6} & 0 & \frac{1}{6} \\ 0 & \frac{5}{6} & \frac{1}{6} \end{bmatrix}
$$

10.2   Aligned Equations

```
$$
\begin{aligned}
Bias(\hat{\theta})  &= E(\hat{\theta}) - \theta \\
Bias(\hat{\theta})  &= E(2 \bar{X} -1) - \theta \\
Bias(\hat{\theta})  &= \frac{2}{n}\sum_{i=1}^n E(X_i) -1 -\theta \\
Bias(\hat{\theta})  &= 2E(X) - 1 - \theta \\
Bias(\hat{\theta})  &= 2 \cdot \frac{\theta+1}{2} - 1 - \theta \\
Bias(\hat{\theta})  &= 0 \\
\end{aligned}
$$
```

Produces the following system of equations

$$
\begin{aligned}
Bias(\hat{\theta}) &= E(\hat{\theta}) - \theta \\
Bias(\hat{\theta}) &= E(2\bar{X} - 1) - \theta \\
Bias(\hat{\theta}) &= \frac{2}{n} \sum_{i=1}^{n} E(X_i) - 1 - \theta \\
Bias(\hat{\theta}) &= 2E(X) - 1 - \theta \\
Bias(\hat{\theta}) &= 2 \cdot \frac{\theta+1}{2} - 1 - \theta \\
Bias(\hat{\theta}) &= 0
\end{aligned}
$$

10.3   Piece-wise Function

`$$ f(x) = \begin{cases} \frac{1}{b-a} \\ 0 \end{cases} $$`

produces the following piece-wise function

$$
f(x) = \begin{cases} \frac{1}{b-a} \\ 0 \end{cases}
$$

11   Pseudo-code of Algorithms

while not convergence:

compute $\nabla(J)$

$\theta_0 := \theta_0 - \alpha \nabla(J)_0$

$\theta_1 := \theta_1 - \alpha \nabla(J)_1$

end while