

# One Hour Tour To LaTeX

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# 1. Introduction

## ♠ Useful LaTeX Books

- *LaTeX: A Document Preparation System*, by Leslie Lamport and Duane Bibby, (\$39.95 from Amazon.com), Addison-Wesley Pub Co, ISBN: 0201529831, 2nd Edition, June 30, 1994.
- *The Latex Companion*, by Michel Goossens, Frank Mittelbach, and Alexander Samarin, (\$39.99 from Amazon.com), Addison-Wesley Pub Co; ISBN: 0201541998; 1st edition, December 31, 1993).
- *Math into LaTeX*, by George Gratzer, (\$34.97 from Amazon.com), Birkhauser, ISBN: 0817641319, 3rd edition (June 23, 2000).

## ♠ Useful Websites

- [www.winedt.com](http://www.winedt.com)
- [www.miktex.org](http://www.miktex.org)
- [sp.uconn.edu/tex.html](http://sp.uconn.edu/tex.html)
- [www.ctan.org](http://www.ctan.org)

## ♠ General Operation

### • On Merlot

1. ssh to merlot
2. Prepare a LaTeX file using a name such as  
`filename.tex`

You can use either vi or emacs or others to type your LaTeX file.

You can also prepare your file on PC and then download to merlot.

3. Compile your LaTeX file using command  
`latex filename`
4. If there are no errors, LaTeX command will automatically produce the following three files:  
`filename.aux`, `filename.log`, and `filename.dvi`.
5. You can print `filename.dvi` on the printer using command:  
`dvips filename.dvi`

6. You can also view your dvi file using MikTeX DVI Viewer.
7. You can also convert your dvi file to a high quality pdf file using command:

`pdflatex filename.tex.`

- **On PC**

1. Download MikTeX from [www.miktex.org](http://www.miktex.org).
2. Download WinEdt from [www.winedt.com](http://www.winedt.com).  
You can have the 31-day trial period.  
You can buy a WinEdt Student License at US \$30.
3. WinEdt and MikTeX are available on all of lab and TA office computers.
4. Edit your filename.tex on WinEdt.
5. Compile your filename.tex using a WinEdt manual bar.
6. View your filename.dvi using a WinEdt manual bar.

7. Convert your filename.dvi to pdf or ps file using a WinEdt manual bar.

## ♠ Document Class

The `\documentclass` command has the following format:

```
\documentclass[12pt]{class}
```

Standard **class** options include

1. article
2. book
3. report
4. letter
5. seminar

You can choose more than one option.

```
\documentclass[11pt,twocolumn]{article}
```

- The common standard options in `\documentclass[.]` are:

**10pt** This is the default size. To make ten-point size, you can simply use

```
\documentclass{article}
```

**12pt** Makes twelve-point type the normal (default) type size instead of ten-point type.

**twoside** Formats the output for printing on both sides of a page. (This is the default in the book style.)

**twocolumn** Produces two-column pages.

**titlepage** For article style only; causes the `\maketitle` command and the abstract environment each to make a separate page. This is the default setting for report and book styles.

**leqno** Puts formula numbers on the left side in equation and eqnarray environments.

**fleqn** left-aligns displayed formulas.



## ♠ Standard Article Document Setting

```
\documentclass[12pt]{article}
\usepackage{epsfig,graphics,latexsym,amsfonts,amssymb,
            amsmath,verbatim}
\hoffset=-0.675in
\advance\topmargin by -0.45truein
\oddsidemargin=0.675truein
\evensidemargin=0.675truein
\advance\textheight by 1.25truein
\setlength\textwidth{6.5in}
\vsize=9.0in
\def\doublespace{\baselineskip=20pt minus 1pt}
```

```
\begin{document}
\title{Introduction to LaTeX}
\author{Your Name \ \ Affiliation}
\maketitle

\begin{center}
\noindent{\large \bf Abstract}
\end{center}

\section{Introduction}
\section{Basics}
\subsection{Math}
\subsection{Display}
\section{Summary}
\section*{References}
\section*{Appendix}
\end{document}
```

## ♠ Standard letter Setting

```
\documentclass[11pt]{letter}
\hoffset=-0.475in
\advance\topmargin by -0.75truein
\oddsidemargin=0.475truein
\evensidemargin=0.475truein
\advance\textheight by 1.25truein
\setlength\textwidth{6.5in}
\vsizer=8.9in
\begin{document}
\address{ your name \\
         email address}
\begin{letter}{ Dr. Who \\
              address line 1 \\
              address line 2 \\
              city, state zip code}

\opening{Dear Who,}
Sincerely Yours,
\vspace*{0.3in}

Your names \\
Your complete address
\end{letter}
\end{document}
```

## ♠ Comments

In the LaTeX environment, you can use

either

```
% this is comments
```

or

```
\begin{comment}  
  this text will be commented out.  
\end{comment}
```

## ♠ Verbatim

Computer codes, or SAS outputs, no matter what special characters they have, may be listed with the verbatim environment:

```
\begin{verbatim}
```

```
...
```

```
\end{verbatim}
```

For example,

Parameter	Standard DF	Estimate	Error	95% Confidence Limits		Chi- Square	Pr > ChiSq
Intercept	1	3.5288	0.9041	1.7567	5.3008	15.23	<.0001
Z1	1	-0.1477	0.4076	-0.9465	0.6511	0.13	0.7171
Z2	1	-0.5866	0.3199	-1.2136	0.0405	3.36	0.0668
Z3	1	-1.5441	0.3633	-2.2561	-0.8321	18.07	<.0001
Z4	1	-0.0175	0.0128	-0.0425	0.0076	1.87	0.1717
Scale	1	0.8848	0.1084	0.6960	1.1250		
Weibull Shape	1	1.1301	0.1384	0.8889	1.4368		

## ♠ Type Size in LaTeX

The following options (from smallest to largest) for type size are available:

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

For example, Commands `{\tiny Statistics}` and `{\Huge Statistics}` give

Statistics **Statistics**

## ♠ Type Style

Common Type Styles include

```
\rm \em \it \bf \sc \sl \tt
```

For example, command `\sc{Ming-Hui Chen}` gives

MING-HUI CHEN

## ♠ List-Making Environments

- Itemized Lists

Three ways to do itemized lists:

```
\begin{itemize}
\item Step 1: edit an input file
\item Step 2: compile the input file
\item Step 3: Print the input file
\end{itemize}
```

- Step 1: edit an input file
- Step 2: compile the input file
- Step 3: Print the input file



```
\begin{itemize}
\item[] Step 1: edit an input file
\item[] Step 2: compile the input file
\item[] Step 3: Print the input file
\end{itemize}
```

Step 1: edit an input file

Step 2: compile the input file

Step 3: Print the input file

```
\begin{itemize}
\item[Step 1:] edit an input file
\item[Step 2:] compile the input file
\item[Step 3:] Print the input file
\end{itemize}
```

Step 1: edit an input file

Step 2: compile the input file

Step 3: Print the input file

- Enumerated Lists

```
\begin{enumerate}
```

```
\item Step 1: edit an input file
```

```
\item Step 2: compile the input file
```

```
\item Step 3: Print the input file
```

```
\end{enumerate}
```

1. Step 1: edit an input file

2. Step 2: compile the input file

3. Step 3: Print the input file

- Description Lists

```
\begin{description}  
\item[Step 1:] edit an input file  
\item[Step 2:] compile the input file  
\item[Step 3:] Print the input file  
\end{description}
```

**Step 1:** edit an input file

**Step 2:** compile the input file

**Step 3:** Print the input file

## ♠ Math Environments

- Mathematics to be typeset inline with the text must be contained in the environment

`\begin{math}...\end{math}`

or

`\(...\)`

or

`...\$`

## An Example:

Three commands:

`display \begin{math} \sin(x^2)=10 \end{math}` in line

`display \(\sin(x^2)=10\)` in line

`display $\sin(x^2)=10$` in line

produce

$$\sin(x^2) = 10$$
 in line

$$\sin(x^2) = 10$$
 in line

$$\sin(x^2) = 10$$
 in line

- **scripts, symbols, common math functions**

Subscripts, superscripts, and math functions are typeset in a mathematics environment.

For example,

`d^{-1}`, `d^2`, `a_i`, `\sin`, `\cos`, `\ln`, `\log`, `\exp`

produce

$d^{-1}$ ,  $d^2$ ,  $a_i$ ,  $\sin$ ,  $\cos$ ,  $\ln$ ,  $\log$ ,  $\exp$

LaTeX has an enormously wide variety of symbols to help typeset mathematics. For example,

`\times, \propto, \sum, \Sigma, \sigma, \pi, \rightarrow, \Rightarrow,`  
`\prod, \coprod, \Longleftarrow, \thicksim, \sim, \subset,`  
`\in, \forall, \cup, \cap, \alpha, \theta, \beta, \int`

$\times, \propto, \sum, \Sigma, \sigma, \pi, \rightarrow, \Rightarrow,$

$\prod, \coprod, \Leftarrow, \sim, \sim, \subset,$

$\in, \forall, \cup, \cap, \alpha, \theta, \beta, \int$



- **displaymath and frac**

Many mathematical equations and expressions are so complicated or so important that they should not be typeset inline with the text, but they should be displayed on a line all by themselves. This is achieved with the environments:

```
\begin{displaymath}
```

```
...
```

```
\end{displaymath}
```

equivalent to the shorter

```
\[
```

```
...
```

```
\]
```

or

```
\begin{equation}
```

```
... \label{eqn1}
```

```
\end{equation}
```

For example,

```
\begin{displaymath}
```

```
I=\int^{\infty}_{-\infty} \frac{x^2}{1+\exp(x^2)} dx.
```

```
\end{displaymath}
```

```
\[
```

```
I=\int^{\infty}_{-\infty} \frac{x^2}{1+\exp(x^2)} dx.
```

```
\]
```

```
\begin{equation}
```

```
I=\int^{\infty}_{-\infty} \frac{x^2}{1+\exp(x^2)} dx.
```

```
\end{equation}
```

$$I = \int_{-\infty}^{\infty} \frac{x^2}{1 + \exp(x^2)} dx.$$

$$I = \int_{-\infty}^{\infty} \frac{x^2}{1 + \exp(x^2)} dx.$$

$$I = \int_{-\infty}^{\infty} \frac{x^2}{1 + \exp(x^2)} dx. \tag{1}$$

- **Equation arrays**

Often we want to align related equations together, or to align each line of a multi-line derivation. The `eqnarray` mathematics environment does this.

```
\begin{eqnarray*}
  f(x) & = & \exp(-x), \quad x>0 \\
  g(x) & = & x^2, \quad -1<x<1 \\
  h(x) & = & x^3, \quad x<0
\end{eqnarray*}
```

or

```
\begin{eqnarray}
  f(x) & = & \exp(-x), \quad x>0 \quad \backslash\text{nonumber} \\
  g(x) & = & x^2, \quad -1<x<1 \\
  h(x) & = & x^3, \quad x<0
\end{eqnarray}
```

$$f(x) = \exp(-x), x > 0$$

$$g(x) = x^2, -1 < x < 1$$

$$h(x) = x^3, x < 0$$

$$f(x) = \exp(-x), x > 0$$

$$g(x) = x^2, -1 < x < 1 \tag{2}$$

$$h(x) = x^3, x < 0 \tag{3}$$

We can also do

```
\begin{align*}
f(x)  = & \exp(-x), \quad x>0 \\
g(x)  = & x^2, \quad -1<x<1 \\
h(x)  = & x^3, \quad x<0
\end{align*}
```

or

```
\begin{align}
f(x)  = & \exp(-x), \quad x>0 \nonumber \\
g(x)  = & x^2, \quad -1<x<1 \\
h(x)  = & x^3, \quad x<0
\end{align}
```

$$f(x) = \exp(-x), x > 0$$

$$g(x) = x^2, -1 < x < 1$$

$$h(x) = x^3, x < 0$$

or

$$f(x) = \exp(-x), x > 0$$

$$g(x) = x^2, -1 < x < 1 \tag{4}$$

$$h(x) = x^3, x < 0 \tag{5}$$

- Matrices and Other Useful Displays

\$\$

```
X \sim N\left( \left( \begin{array}{c} \mu_1 \\ \mu_2 \end{array} \right), \begin{pmatrix} \sigma_1^2 & \sigma_1 \sigma_2 \rho \\ \sigma_1 \sigma_2 \rho & \sigma_2^2 \end{pmatrix} \right)
```

\$\$

gives

$$X \sim N \left( \begin{pmatrix} \mu_1 \\ \mu_2 \end{pmatrix}, \begin{pmatrix} \sigma_1^2 & \sigma_1 \sigma_2 \rho \\ \sigma_1 \sigma_2 \rho & \sigma_2^2 \end{pmatrix} \right)$$

\$\$

```
\overline{Y}=\frac{1}{n}\sum_{i=1}^n Y_i
```

\$\$

\$\$

```
\sqrt{n} \Bigg( \frac{\overline{Y}-\mu}{\sigma}
```

```
\Bigg)
```

```
\stackrel{D}{\longrightarrow}
```

```
N\Big(0, 1 \Big)
```

\$\$

display the formulas:

$$\bar{Y} = \frac{1}{n} \sum_{i=1}^n Y_i$$

$$\sqrt{n} \left( \frac{\bar{Y} - \mu}{\sigma} \xrightarrow{D} \right) N(0, 1)$$



```

\begin{equation}
f(x) = \begin{cases}
\lambda \exp(-\lambda x) & \text{\mbox{if } $x>0$}, \\
0 & \text{\mbox{otherwise}}.
\end{cases}
\end{cases}
\label{eqnf}
\end{equation}

```

$$f(x) = \begin{cases} \lambda \exp(-\lambda x) & \text{if } x > 0, \\ 0 & \text{otherwise.} \end{cases} \quad (6)$$

## ♠ Tables

```

\begin{center}
{\bf Table 1: Parameter Estimates} \\
\medskip

\begin{tabular}{|l|crrrrrc|}\hline
& & & Standard & \multicolumn{2}{c}{95\% Confidence} & Chi- & \\
Parameter & DF & Estimate & Error & \multicolumn{2}{c}{Limits} & & \\
& & & Square & Pr & & & ChiSq \\
\hline
Intercept & 1 & 3.5288 & 0.9041 & 1.7567 & 5.3008 & 15.23 & <$.0001 \\
Z1 & & -0.1477 & 0.4076 & -0.9465 & 0.6511 & 0.13 & 0.7171 \\
Z2 & & -0.5866 & 0.3199 & -1.2136 & 0.0405 & 3.36 & 0.0668 \\
Z3 & & -1.5441 & 0.3633 & -2.2561 & -0.8321 & 18.07 & <$.0001 \\
Z4 & & -0.0175 & 0.0128 & -0.0425 & 0.0076 & 1.87 & 0.1717 \\
Scale & & 0.8848 & 0.1084 & 0.6960 & 1.1250 & & \\
Weibull Shape & 1 & 1.1301 & 0.1384 & 0.8889 & 1.4368 & & \\
\hline
\end{tabular}
\end{center}

```

**Table 1: Parameter Estimates**

Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	3.5288	0.9041	1.7567	5.3008	15.23	<.0001
Z1	1	-0.1477	0.4076	-0.9465	0.6511	0.13	0.7171
Z2	1	-0.5866	0.3199	-1.2136	0.0405	3.36	0.0668
Z3	1	-1.5441	0.3633	-2.2561	-0.8321	18.07	<.0001
Z4	1	-0.0175	0.0128	-0.0425	0.0076	1.87	0.1717
Scale	1	0.8848	0.1084	0.6960	1.1250		
Weibull Shape	1	1.1301	0.1384	0.8889	1.4368		

## ♠ Figures

### • Format I

```
\begin{figure}[htbp]
  \begin{center}
    \includegraphics[height=2in,width=4in,angle=270]{KM.ps}
    \caption{Kaplan-Meier plot for E1684 data}
    \label{fig:label}
  \end{center}
\end{figure}
```

This command does not work (properly) in

```
\documentclass[]{seminar}
```

- **Format II**

The following commands work almost in all environments:

```
\begin{figure}[hbpt]
\centerline{\psfig{figure=KM.ps,height=2.0 in,width=4.0 in}}
\centering{Fig. 1: Kaplan-Meier plot for E1684 data}
\end{figure}
```

or

```
\begin{figure}[hbpt]
\centerline{\psfig{figure=KM.ps,height=2.0 in,width=4.0 in}}
\caption{Kaplan-Meier plot for E1684 data}
\label{fig:KM}
\end{figure}
```

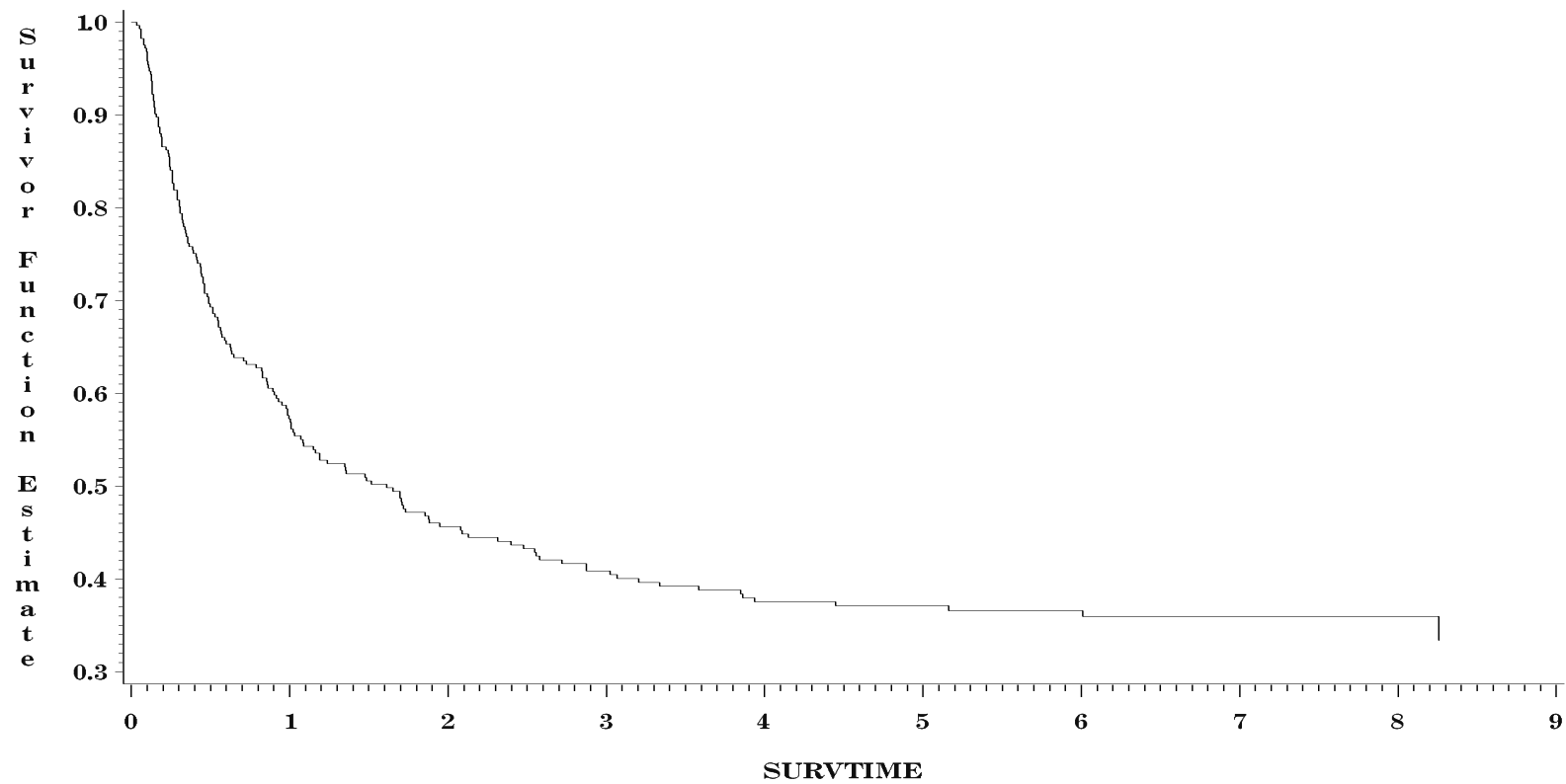


Fig. 1: Kaplan-Meier plot for E1684 data

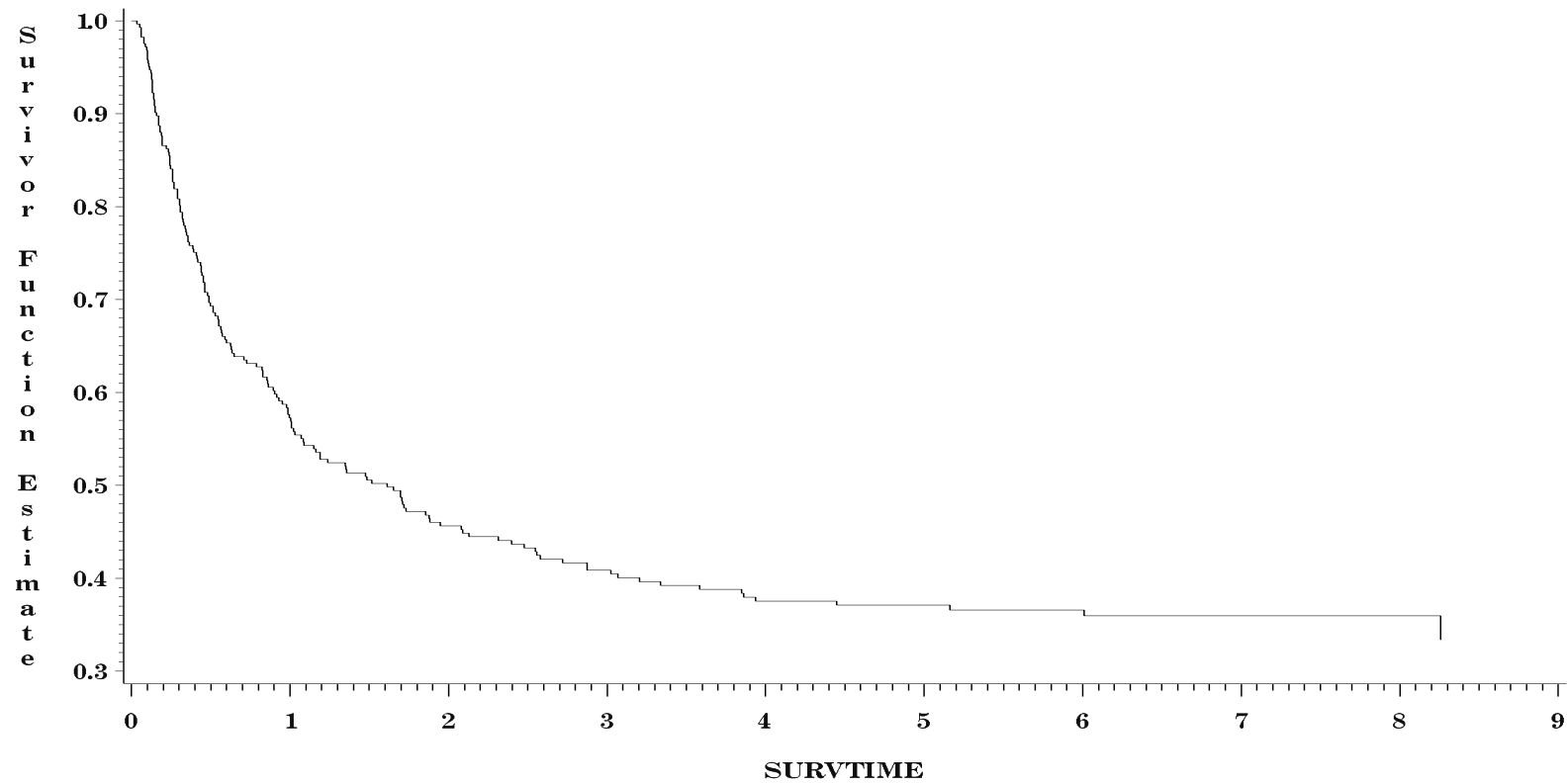


Figure 1: Kaplan-Meier plot for E1684 data