

# THE LINEAR REGRESSION PROCESS

From Generation to Interpretation

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- 2 Pre-Installation
  - What is LaTeX?
  - Using LaTeX Inside Schoology, Google Docs, and Other Web-Based Applications
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# Regression at MMC

## notes

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# 1 Prologue: Standard Deviation

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How much variability, on average, is there around the mean?

Score	Deviation	Squared Deviation
-------	-----------	-------------------

$x$		
-----	--	--

---

2		
---	--	--

4		
---	--	--

6		
---	--	--

8		
---	--	--

15		
----	--	--

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# What is $\text{\LaTeX}$ ?

There is only one large computer program I have used in which there are to a decent approximation 0 bugs: Don Knuth's  $\text{\TeX}$ .

---

– *Jaap Weel* \_

What

is

L<sup>A</sup>T<sub>E</sub>X?

```
\begin{tikzpicture}[scale=1.0]
\usetikzlibrary{arrows}
\draw[latex-latex] (-2.5,0) -- (3.5,0);
  \foreach \x in {-2,-1,0,1,2,3}
    \draw[shift={(\x,0)},color=black] (0pt,3pt) -- (0pt,-3pt);
  \foreach \x in {-2,-1,0,1,2,3}
    \draw[shift={(\x,0)},color=black] (0pt,0pt) -- (0pt,-3pt) node[below] {$\x$};
\draw[very thick,*-o,blue] (-2,0) -- (-.5,0);
\node at (-2,.3) {A};
\node at (-.5,.3) {B};
\fill (0.8,0) circle[radius=2.5pt];
\node at (0.8,.3) {C};
```





```
m= \frac{y_2-y_1}{x_2-x_1}
```

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

```
x= \frac{-b \pm \sqrt{b^2-4ac}}{2a}
```

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

# Getting Help

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# Getting and Starting

<https://www.latex-project.org/get/>

Files

TeXShop Code Editor

Output

# The TeXLive Utility

Skim pdf viewer  
free

Sublime Text 3 code editor  
\$80 donationware

Text Expander  
about \$28/year education



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4 **Diagrams and Graphs**

- Blank Grids

- Functions
- **Diagrams**

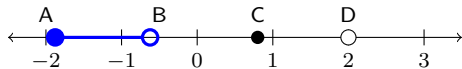
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# Number Line



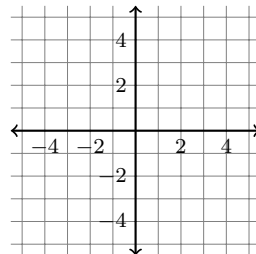
```
\begin{tikzpicture}[scale=1.0]
\usetikzlibrary{arrows}
\draw[latex-latex] (-2.5,0) -- (3.5,0);
\foreach \x in {-2,-1,0,1,2,3}
  \draw[shift={(\x,0)},color=black] (0pt,3pt) -- (0pt,-3pt) node[below] {$\x$};
\draw[very thick,*-o,blue] (-2,0) -- (-.5,0);
\node at (-2,.3) {A};
\node at (-.5,.3) {B};
\fill (0.8,0) circle[radius=2.5pt];
\node at (0.8,.3) {C};
\draw[fill=white] (2,0) circle (.1cm);
\node at (2,.3) {D};
\end{tikzpicture}
```

# Cartesian Plane

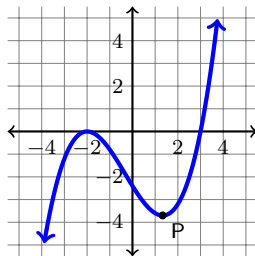
```

\begin{tikzpicture}[xscale=.3,yscale=.3]
  \draw[style = help lines, step=1cm] (-5.5,-5.5) grid (5.5,5.5);
  \draw[thick,<->] (-5.5,0) -- (5.5,0) node[anchor=north west] {};
  \draw[thick,<->] (0,-5.5) -- (0,5.5) node[anchor=south east] {};
  \foreach \x in {-4,-2,2,4}
    \draw (\x cm,1pt) -- (\x cm,-1pt) node[anchor=north] {$\x$};
  \foreach \y in {-4,-2,2,4}
    \draw (1pt,\y cm) -- (-1pt,\y cm) node[anchor=west] {$\y$};
\end{tikzpicture}

```

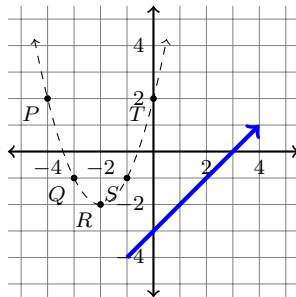


# Function with Point



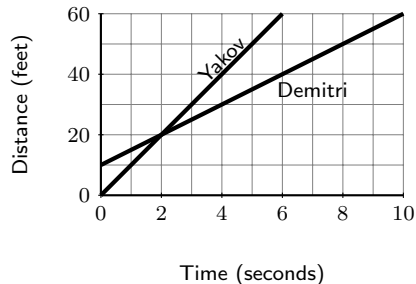
```
\draw[ultra thick,blue,<->] plot[domain=-3.89:3.75,samples=100] (\x,{.2*(\x+2)^2*(\x-3)});  
\fill (1.33,-3.7) circle[radius=5pt] node[anchor=north west]{P};
```

# Points, Dashed Line and Piecewise



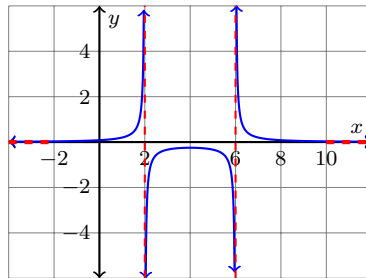
```
\foreach\x/\y/\z in {-4/2/P,-3/-1/Q,-2/-2/R,-1/-1/S,0/2/T}
  \draw [fill=black] (\x,\y)circle (3pt) node[below left] {\z};
\draw[dashed,<->] plot[domain=-4.5:0.5,samples=100] (\x,{(\x+2)^2-2});
\draw[->,ultra thick,blue] (-1,-4) -- (4,1);
```

# Changing Scale



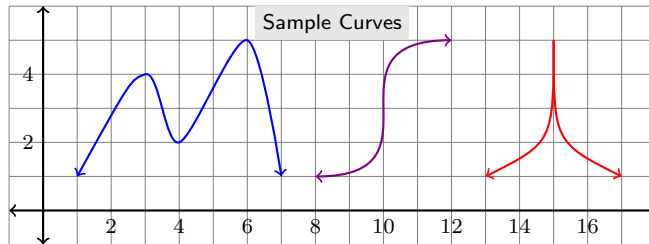
```
\begin{tikzpicture}[y=.05cm, x=.5cm]
  \draw[style=help lines, ystep=10, xstep=1] (0,0) grid (10,60);
  \draw[thick,-] (0,0) -- coordinate (x axis mid) (10,0);
  \draw[thick,-] (0,0) -- coordinate (y axis mid) (0,60);
  \foreach \x in {0,2,4,6,8,10}
    \draw (\x ,1pt) -- (\x ,-1pt) node[anchor=north] {$\x$};
  \foreach \y in {0,20,40,60}
    \draw (1pt,\y ) -- (-1pt,\y ) node[anchor=east] {$\y$};
  \draw[-, ultra thick, domain=-0:6,smooth] plot (\x, {10*\x});
  \node[rotate=45] at (4,45) {Yakov};
  \node[rotate=0] at (7,35) {Demitri};
  \draw[-, ultra thick, domain=-0:10,smooth] plot (\x, {5*\x+10});
  \node[below=0.8cm] at (x axis mid) {Time (seconds)};
  \node[rotate=90, above=0.8cm] at (y axis mid) {Distance (feet)};
\end{tikzpicture}
```

# Rational Function



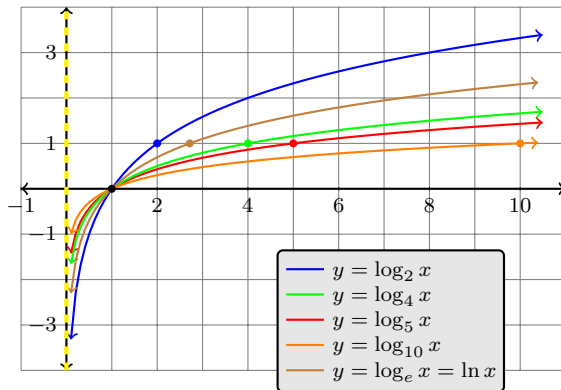
```
\draw[blue,<->, thick, domain=-4:1.959,smooth,samples=200] plot (\x, {1/(\x*\x-8*\x+12)});
\draw[blue,<->, thick, domain=2.042:5.958,smooth,samples=200] plot (\x, {1/(\x*\x-8*\x+12)});
\draw[blue,<->, thick, domain=6.041:12,smooth,samples=200] plot (\x, {1/(\x*\x-8*\x+12)});
\draw[red,thick,dashed] (2,-6) -- (2,6);%Vert Asymp
\draw[red,thick,dashed] (6,-6) -- (6,6);%Vert Asymp
\draw[red,ultra thick,dashed] (-4,0) -- (-2,0);%Horiz Asymp
\draw[red,ultra thick,dashed] (10,0) -- (12,0);%Horiz Asymp
```

# Drawing Curves



```
\draw[blue,<->,thick] plot [smooth] coordinates {(1,1) (3,4) (4,2) (6,5) (7,1)};
\draw[violet, thick,<->] (8,1) .. controls (12,1) and (8,5) .. (12,5);
\draw[red, thick,<-] (13,1) .. controls (15,2) .. (15,5);
\draw[red, thick,->] (15,5) .. controls (15,2) .. (17,1);
\node[fill=black!10] at (8.5,5.5) {Sample Curves};
```



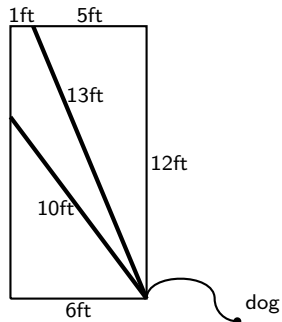


## Adding a Legend

&

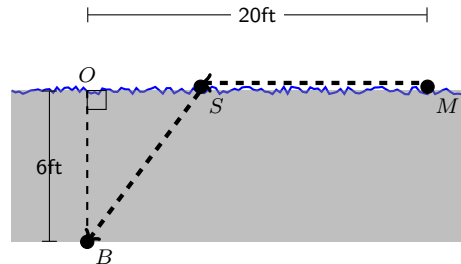
► The TIKZ Gallery of Examples

```
\node[draw=black,thick,fill=black!10,rounded corners=2pt,below left=2mm] at (10,-1) {%
\begin{tabular}{@{}r@{}l@{}}
\raisebox{2pt}{\tikz\draw[thick,blue] (0,0) -- (5mm,0);}&{$y=\log_2 x$}\\
\raisebox{2pt}{\tikz\draw[thick,green] (0,0) -- (5mm,0);}&{$y=\log_4 x$}\\
\raisebox{2pt}{\tikz\draw[thick,red] (0,0) -- (5mm,0);}&{$y=\log_5 x$}\\
\raisebox{2pt}{\tikz\draw[thick,orange] (0,0) -- (5mm,0);}&{$y=\log_{10} x$}\\
\raisebox{2pt}{\tikz\draw[thick,brown] (0,0) -- (5mm,0);}&{$y=\log_e x = \ln x$}
\end{tabular}};
```



```
%\draw[gray] (0,-2) grid (10,12);
```

```
\draw [-,thick] (6,0) [out=90 ,in=90] to
  (9,0) [out=270 ,in=180 ] to (10,-1);
```



```
\usetikzlibrary{calc}
\newcommand\irregularline[2]{%
  let \n1 = {rand*(#1)} in
  +(0,\n1)
  \foreach \a in {0.1,0.2,...,#2}{
    let \n1 = {rand*(#1)} in
    -- +(\a,\n1)
  }
}
```

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# The Article Documentclass

```
\documentclass[11pt]{article}
\usepackage{lipsum}%demo purposes only

\begin{document}

\title{A Document}
\author{Mr. Briody}
\date{\today}

\maketitle

\section{Introduction}
Solve this:  $\pi x^2 - ex + i = 0$ 
\lipsum[2-4]
\end{document}
```

# \documentclass{extarticle}

```
\documentclass[9pt]{extarticle}
\usepackage[margin=2cm]{geometry}
\usepackage{fancyhdr}
\usepackage{multicol}
\usepackage{lipsum}%demo purposes only

\newcommand{\thedate}{8/26/2014}
\newcommand{\theexam}{Candy Bar Contest}
\newcommand{\thecourse}{PreCalculus $
  \infty$ Briody}
```

```
\thispagestyle{plain}%first page setup
\parindent 0ex
\textbf{\thecourse} \hfill \textbf{Name:}
\makebox[6cm]{\hrulefill}

\textbf{\theexam} \hfill \textbf{\thedate}
```



# \documentclass{extarticle}

```
\pagestyle{fancy}%headers and footers for  
all pages except first  
\lhead{\thecourse} \chead{\theexam} \rhead  
{\thedate}  
\lfoot{} \cfoot{\thepage} \rfoot{}
```

```
\rule[1ex]{\textwidth}{.1pt} %horizontal  
line  
{\large {\bf Directions} }  
  
Do these correctly.\.[.5in]  
  
Content\\  
\begin{multicols}{2}  
  \lipsum[1-3]  
\end{multicols}  
  
\newpage  
Second page content  
  
\end{document}
```

Benefits of using  $\LaTeX$  for creating assessments:

- 1 Questions are numbered automatically
- 2 Referenced questions are updated automatically
- 3 Questions are labeled with points which are transferred to a scoring table that includes total possible
- 4 Questions can be organized by difficulty level
- 5 Multiple or scrambled versions are possible

exsheets Package vs. `\documentclass[examdesign]`

# Labels & References

```
\begin{question}[class=easy] \label{intb}  
  \addpoints{3}
```

```
What are the x-intercepts and y-intercepts  
for question \ref{intb}.
```

# exsheets Package

```

\usepackage{exsheets}
\SetupExSheets{solution/print=false,question/name={},solution/name={}} %Solutions on or off;
\SetupExSheets{headings=runin} % Puts questions next to number
\SetupExSheets{use-classes={easy,medium,hard}} % Print questions by difficulty level
\SetupExSheets{points}{name=points} % Puts questions next to number
\SetupExSheets{headings = margin-nr}
\newcommand*\pointsformat[1]{(#1) }
\SetupExSheets{points/format = \pointsformat}

```

```

\begin{question}[class=easy]\addpoints{7}
  If  $f(x)=x^2-3x$  find
  \begin{enumerate}
    \item  $f(-2)$ 
    \item  $f(a)$ 
    \item  $f(x+h)$ 
  \end{enumerate}
  \hfill \makebox[1.3in]{\hrulefill}\hspace{1.5in}
\end{question}
\begin{solution}
\end{solution}

```

# exsheets Package

## Scoring table

```
\begin{center}
{\Large
\begin{tabular}{|l|*{\numberofquestions}{c|}c|}\hline
  Question & \ForEachQuestion{\GetQuestionProperty{counter}{\#1}\iflastquestion{}{\&}} & Total & \\
  \hline
  Points    & \ForEachQuestion{\GetQuestionProperty{points}{\#1}\iflastquestion{}{\&}} & & \pointssum* \\
  & & & \hline
  Score    & \ForEachQuestion{\iflastquestion{}{\&}} & & \hline
\end{tabular}
}
\end{center}
```



# \documentclass{examdesign}

## Blocks

```

\begin{block}[questions=2]
\hrulefill\\
For questions \thefirst \, and \thelast,  $f'(x)=x\sin(x)-\cos(x)$  for  $0<x<4$ . Use your calculator.

\begin{question}
 $f$  has a local maximum when  $x$  is approximately
\choice {$0.9$}
\choice {$1.2$}
\choice {$2.3$}
\choice [!]{3.4}
\choice {$3.7$}
\end{question}

\begin{question}
 $f$  has a point of inflection when  $x$  is approximately
\choice {$0.9$}
\choice {$1.2$}
\choice [!]{2.3}
\choice {$3.4$}
\choice {$3.7$}
\end{question}
\hrule
\end{block}

```

```
\documentclass{examdesign}
```

## Templates

```
\NumberOfVersions{3}
```

```
\setrandomseed{2019}
```

```
\NoRearrange %comment out to randomize
```





- 1 mail merge
- 2 info from external file
- 3 source and bibliography
- 4 animations
- 5 envelopes

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- 1 Code hunt: look for sample code.
- 2 Compile often.
- 3 Comment out chunks of code (using `command-option-/*`) to troubleshoot bugs.
- 4 Start small: create standalone diagrams or graphs.
- 5 Make a simple document like a half-sheet daily quiz.
- 6 Make a simple short presentation to go over homework or test prep.
- 7 Don't try to include everything.
- 8 Google search "latex matrix" and get familiar with [stackexchange.com](https://stackoverflow.com).

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