```
\documentclass[letterpaper,12pt]{article}
\usepackage{array}
\usepackage{threeparttable}
\usepackage{geometry}
\geometry{letterpaper,tmargin=1in,bmargin=1in,lmargin=1.25in,rmargin=1.25in}
\usepackage{fancyhdr,lastpage}
\pagestyle{fancy}
\lhead{}
\chead{}
\rhead{}
\lfoot{}
\cfoot{}
\rfoot{\footnotesize\textsl{Page \thepage\ of \pageref{LastPage}}}
\renewcommand\headrulewidth{0pt}
\renewcommand\footrulewidth{0pt}
\usepackage[format=hang,font=normalsize,labelfont=bf]{caption}
\usepackage{listings}
\lstset{frame=single,
  language=Python,
  showstringspaces=false,
  columns=flexible,
  basicstyle={\small\ttfamily},
  numbers=none,
  breaklines=true,
  breakatwhitespace=true
  tabsize=3
}
\usepackage{amsmath}
\usepackage{amssymb}
\usepackage{amsthm}
\usepackage{harvard}
\usepackage{setspace}
\usepackage{float,color}
\usepackage[pdftex]{graphicx}
\usepackage{hyperref}
\hypersetup{colorlinks,linkcolor=red,urlcolor=blue}
\theoremstyle{definition}
\newtheorem{theorem}{Theorem}
\newtheorem{acknowledgement}[theorem]{Acknowledgement}
\newtheorem{algorithm}[theorem]{Algorithm}
\newtheorem{axiom}[theorem]{Axiom}
\newtheorem{case}[theorem]{Case}
\newtheorem{claim}[theorem]{Claim}
\newtheorem{conclusion}[theorem]{Conclusion}
\newtheorem{condition}[theorem]{Condition}
\newtheorem{conjecture}[theorem]{Conjecture}
\newtheorem{corollary}[theorem]{Corollary}
\newtheorem{criterion}[theorem]{Criterion}
\newtheorem{definition}[theorem]{Definition}
\newtheorem{derivation}{Derivation} % Number derivations on their own
\newtheorem{example}[theorem]{Example}
\newtheorem{exercise}[theorem]{Exercise}
\newtheorem{lemma}[theorem]{Lemma}
\newtheorem{notation}[theorem]{Notation}
\newtheorem{problem}[theorem]{Problem}
\newtheorem{proposition}{Proposition} % Number propositions on their own
\newtheorem{remark}[theorem]{Remark}
\newtheorem{solution}[theorem]{Solution}
\newtheorem{summary}[theorem]{Summary}
%\numberwithin{equation}{section}
```

```
\bibliographystyle{aer}
\newcommand\ve{\varepsilon}
\newcommand\boldline{\arrayrulewidth{1pt}\hline}


\begin{document}

\begin{flushleft}
  \textbf{\large{Problem Set \#2}} \\
  MACS 30000, Dr. Evans \\
  Cheng Yee Lim
\end{flushleft}

\vspace{5mm}

\noindent\textbf{Problem 1}\\
\textbf{Part (d).} \\
Using slicing functions of NumPy arrays, I wrote a function to find the maximum four adjacent numbers of a 20*20 matrix.
First, I sliced the NumPy array into four 17*20 grids and multiplied them with each other to obtain the the possible products of four vertically adjacent numbers.\\\\
Second,  I sliced the NumPy array into four 20*17 grids and multiplied them with each other to obtain the possible products of four horizontally adjacent numbers.
\\\\
Third,  I sliced the NumPy array into four 17*17 grids, beginning from the top-left corner of the grid. The next grid's starting point will be one element right and down away from the last grid's starting point. The multiplication of these four 17*17 grids will then give  all possible products of four diagonally-down adjacent numbers.\\\\
Lastly, I sliced the NumPy array into four 17*17 grids, beginning from the bottom-left corner of the grid. The next grid's starting point would be one element right and up from the previous grid's starting point. The multiplication of these four grids will give all possible products of four diagonally-up adjacent numbers.\
\flushleft The maximum product of 4 adjacent numbers in the 20*20 grid is 70,600,674.\\\


\noindent\textbf{Problem 2}\\
\textbf{Part (c).} \\
\flushleft We defined two functions $kill\_outliers()$ and $threescrubs()$ to remove outliers of an one-dimensional array. We randomly generated 10,000 draws from our lognormal distribution and used the two functions to remove outliers that are more than three standard deviations away from the mean. \\

\flushleft The number of elements in the returned array is 9973.
The mean of the returned array is 4.24744059848.
The standard deviation of the returned array is 0.19683241144.\\\

\newpage
\noindent\textbf{Problem 3}\\
\textbf{Part (b)(ii).}
\flushleft Using the pandas groupby command, I found the percentage of the total population that is male and female from 2010 to 2015.\

\begin{table}[htbp] \centering \captionsetup{width=6.0in}
\caption{\label{TabExample}\textbf{Percentage of total population of a specific gender from year 2010 to 2015}}
  \begin{threeparttable}
```

```
  \begin{tabular}{>{\small}l |>{\small}c | >{\small}c |>{\small}c | >{\small}c |
>{\small}c | >{\small}c |}
    \hline\hline
    Gender & 2010 & 2011 & 2012 & 2013 & 2014 & 2015 \\
    \hline
    Male & 0.491642\% & 0.491763\% & 0.491945\% & 0.492077\% & 0.492166\% &
0.492284\%\\
    \hline
    Female & 0.508358\% & 0.508237\% & 0.508055\% & 0.507923\% & 0.507834\% &
0.507716\%\\
    \hline\hline
  \end{tabular}
  \end{threeparttable}
\end{table}


\end{document}
```