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COLLEGE OF ARTY SCIENCE

OF CABBAGES AND KINGS:

AN ANALYSIS OF THE USE OF THE COLON IN DISSERTATION TITLES

By

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To my parents, who always suspected I'd end up here

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Many thanks are due to many people. My major professor didn't know what she was getting herself into when she took me on as a student, and I will always be grateful for her support and guidance. The other members of my committee deserve hazard pay, and this paper would not be the same without their diligence: many thanks.

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LIST OF SYMBOLS

The following short list of symbols are used throughout the document. The symbols represent quantities that I tried to use consistently.

π	$3.1415926\ldots$
E	mc^2
F	ma
R_e	Mean Radius of the Earth $\approx 6367.65\,\text{km}$
e	Base of Natural Logarithms $\approx 2.71828\ldots$
P	The principal borrowed
N	The number of payments
i	The fractional (periodic) interest rate
P_j	The principal part of payment j
I_j	The interest part of payment j
B	A final balloon payment
x	The regular payment
R	The principal remaining after r payments
r	Some number of payments such that $0 < r < N$
R_j	The principal remaining after j payments
A_j	The total interest paid out after j payments

ABSTRACT

The FSU Thesis Class is a LaTeX document class useful for writing Theses, Dissertations, and Treatises. It has several custom macros and environments which are intended to ease the burden of formatting for writers of these documents so that they may focus more on the research and presentation rather than on the page layout. This sample document is intended to provide a few examples of how most of the class features may be used.

The main source file for this document is `thesis.tex`, and this is where you should start reading. The document's source is spread over several files. Many of the files contain helpful LaTeX comments which are not printed out here. It may be instructive to look at the source files as you read this "output" to see how the document was created.

CHAPTER 1

A DERIVATION OF A FORMULA FOR AMORTIZATION

This chapter contains several examples of the equation environment and equation references. There are also examples of every level of heading, from `\chapter` to `\subparagraph` (though these headings are somewhat artificial). The `amsmath` package is required to process this chapter, and so the `thesis.tex` file in this directory contains the package line `\usepackage{amsmath}`. The text of this file is located in the file `math.tex`. If you're new to LaTeX, you may find it instructive to look at the source text (which contains some extra documentation written as LaTeX comments) while reviewing this printed output.

The text and mathematics in this document are my own work, written in the mid-1980s when I was trying to figure out how long it would take to pay off my credit card debt after I had graduated. (This work is the basis of my on-line amortization calculator at the following web address: `http://bretwhissel.net/amortization/amortize.html`.) This material became a convenient test bed as I developed the FSU thesis macros.

1.1 Definitions

This is my derivation of the formula for amortization. The goal is to find a payment amount, x, which pays off the loan principal, P, after a specified number of payments, N. Variable definitions are listed in table **??**.

1.1.1 Payment Schedule

Assuming that all payments (excluding an optional final balloon payment) are the same amount, a payment x consists of its interest part and its principal part:

$$x = I_j + P_j \tag{1.1}$$

Table 1.1: The List of Variables

P	The principal borrowed
N	The number of payments
i	The fractional (periodic) interest rate
P_j	The principal part of payment j
I_j	The interest part of payment j
B	A final balloon payment
x	The regular payment

$$I_1 = iP \qquad P_1 = x - I_1$$

$$I_2 = i(P - P_1) \qquad P_2 = x - I_2$$

$$I_3 = i(P - P_1 - P_2) \qquad P_3 = x - I_3, \text{ etc.}$$

This schedule states that the payment x includes interest on all of the remaining principal, including that which is part of the current payment. The first payment, therefore, includes an interest payment on the total borrowed, which defines the minimum payment. (If we are to make any progress toward paying off the loan, we must pay more than the amount iP.)

The P_j's may be rewritten into a recurrence relation:

$$\begin{aligned}
P_1 &= x - iP \\
P_2 &= x - i(P - P_1) \\
&= x - i\left[P - (x - iP)\right] \\
&= x - iP + ix - i^2P \\
&= (x - iP)(1 + i) \\
P_3 &= x - i(P - P_1 - P_2) \\
&= x - i\left[P - (x - iP) - (x - iP + ix - i^2P)\right] \\
&= x + 2ix + i^2x - iP - 2i^2P - i^3P \\
&= x(1 + i)^2 - iP(1 + i)^2 \\
&= (x - iP)(1 + i)^2
\end{aligned}$$

In general, we will find that

$$P_j = (x - iP)(1 + i)^{j-1}. \tag{1.2}$$

1.2 Balloon Payment

If there is to be a balloon payment, then the final payment will consist of the final principal payment P_f and interest on that principal iP_f so that $B = P_f + iP_f$. Rewriting P_f in terms of B gives $P_f = B/(1+i)$.

1.3 Finding a Solution

1.3.1 Defining the Equation

Next, we define an equation which uses these ideas:

$$B + Nx = P + \sum_{j=1}^{N} I_j + i\left(\frac{B}{1+i}\right), \tag{1.3}$$

or in English, the sum of all the payments (left side) is equal to the principal borrowed plus all of the interest paid with regular payments plus interest paid on the balloon payment (right side). Note that if there will be no balloon payment ($B = 0$), then the B terms drop out.

1.3.2 Breaking It Down

Now we glue some more pieces together: replace I_j of equation (**??**) using the relationship given by eq. (**??**) and then substitute the recurrence identity of eq. (**??**):

$$\begin{aligned} B - \frac{iB}{1+i} + Nx &= P + \sum_{j=1}^{N} \left[x - (x - iP)(1+i)^{j-1}\right] \\ B - \frac{iB}{1+i} + Nx &= P + Nx - (x - iP)\sum_{j=1}^{N}(1+i)^{j-1} \\ P - B\left(1 - \frac{i}{1+i}\right) &= (x - iP)\sum_{j=1}^{N}(1+i)^{j-1} \end{aligned} \tag{1.4}$$

Initial Solution. Now we can see our way clear to solve for x:

$$x = \frac{P - B\left(1 - \frac{i}{1+i}\right)}{\sum_{j=1}^{N}(1+i)^{j-1}} + iP. \tag{1.5}$$

Finding a Closed Form. While a computer program could be written to solve the problem as it is, a closed-form solution (i.e., without the iteration) is preferable.

Isolation. The series form of eq. (**??**) can be rewritten without the series after a little transformation. First, we separate the summation and rewrite its limits:

$$x = \left[P - B\left(1 - \frac{i}{1+i}\right)\right] \frac{1}{\sum_{j=0}^{N-1}(1+i)^j} + iP. \tag{1.6}$$

Transformation. To simplify the transformation, we can substitute by letting $g = 1 + i$ so that the summation looks like $\sum_{j=0}^{N-1} g^j$. Next we multiply the series by $(1-g)/(1-g)$, which causes all but the first and last terms to drop out:

$$\frac{(1-g)\sum_{j=0}^{N-1} g^j}{1-g} = \frac{\sum_{j=0}^{N-1} g^j - \sum_{j=0}^{N-1} g^{j+1}}{1-g} = \frac{1-g^N}{1-g}. \tag{1.7}$$

Result. Since the series is originally in the denominator, we invert the transformed result, and then undo the substitution:

$$x = \left[P - B\left(1 - \frac{i}{1+i}\right)\right] \frac{1-(1+i)}{1-(1+i)^N} + iP. \tag{1.8}$$

Rearranged. Now we can expand and rearrange to taste:

$$x = i\left[\frac{P(1+i)^N}{(1+i)^N - 1} + \frac{B}{(1+i) - (1+i)^{N+1}}\right]. \tag{1.9}$$

Quod erat demonstrandum ("That which was to be shown"), recognized in most mathematical circles as the initials Q.E.D. □

1.4 Application

Two forms. Equations (**??**) and (**??**) solve for the payment amount, but either can be rearranged to solve for any of the other variables, with the exception of i, the periodic interest rate. To date I have been unable to find an analytic solution for this variable, so the program invokes an iterative method to find successive approximations to the solution.

Computation. To reduce the number of computations, $1 + i$ can be stored in single variable, as well as a single calculation of $(1 + i)^N$. Then the calculation of $(1 + i)^{N+1}$ merely requires multiplying the two previously-calculated values, i.e., $(1 + i)^{N+1} = (1 + i)^N \cdot (1 + i)$.

CHAPTER 2

CITATIONS AND REFERENCES

In this chapter I demonstrate how to use features of LaTeX and the fsuthesis class to help me create a list of references or bibliography. There are two options: (1) use the `references` environment and enter bibliographic entries with styling that I create myself, or (2) use the LaTeX `\cite` macro and BibTeX to order and style the bibliographic entries according to a pre-defined style sheet.

2.1 Using the `references` Environment

Let's start simply. Assuming we don't have many citations, we'll create a references section manually using the `\begin{references}` environment provided by the fsuthesis class. If your discipline has a style guide for presenting references, you should use that information to create your own entries. Here are some example entries with explicit formatting specified:

```
\begin{references}
Picaut, J., F. Masia, and Y. du Penhoat, 1997: An advective-reflective
conceptual model for the oscillatory nature of the ENSO.
\textit{Science}, \textbf{277}, 663--666.

Yasunari, T., 1990: Impact of Indian monsoon on the coupled
atmosphere/ocean system in the tropical Pacific.
\textit{Meteor. Atmos. Phys.}, \textbf{44}, 19--41.
\end{references}
```

Note that I had to specify italics and bold-facing myself, according to the style guide that I'm using. (If you don't have a discipline-specific style guide, see [**?**] or [**?**] for lots of bibliographic examples.) The `references` environment provides exdented entries, spacing, and a heading, but the rest of the formatting is up to you. Likewise, citations of these references within your document must be formatted manually. Once processed, the reference entries above look like the following:

Picaut, J., F. Masia, and Y. du Penhoat, 1997: An advective-reflective conceptual model for the oscillatory nature of the ENSO. *Science*, **277**, 663–666.

Yasunari, T., 1990: Impact of Indian monsoon on the coupled atmosphere/ocean system in the tropical Pacific. *Meteor. Atmos. Phys.*, **44**, 19–41.

2.2 Citations and BibTeX

If your thesis or dissertation does not have many citations or references, then the `references` environment may be all you need. However, if you have more than a handful of citations, you owe it to yourself to invest a little more energy into learning about the powerful, time-saving features of BibTeX. To use BibTeX, bibliographic entries are added to an external file with attributes identifying elements of the entry, such as authors, titles, journals, etc. You may then cite a reference in your document using its unique key. Many disciplines have developed large BibTeX databases already, so if you're lucky, you only need download a pre-built file ready to go. You can always add a few more references if those entries don't already exist in the file you download.

For this sample document, I have created a small BibTeX bibliography database in a file called `myrefs.bib` which is excerpted from a larger collection of pre-generated TeX-related entries I downloaded from the web. If your discipline does not already distribute BibTeX databases publicly, it's just a bit more typing to create your own BibTeX file. As an example, here's what a BibTeX entry might look like:

```
@Article{Picaut:1997,
  author = "J. Picaut and F. Masia and Y. du Penhoat",
  title = "An advective-reflective conceptual model for
    the oscillatory nature of the ENSO",
  volume = "277",
  year = "1997",
  journal = "Science",
  pages = "663--666"
}
```

Another advantage of the BibTeX approach is that you can continue to add to this database throughout your professional career, creating entries as you read books and journal articles you may want to reference in the future. I encourage you to refer to the standard LaTeX references (e.g., [**?**] and [**?**]) or to search the web for further information on creating your own BibTeX database.

Once you've created or downloaded a BibTeX database, you may cite a document using its unique *key* as an argument to the LaTeX `\cite` macro. For example, in the previous paragraph, I used the commands `\cite{Lamport:1994:LDP}` and `\cite{Kopka:2004:GLT}`, where `Lamport:1994:LDP` and `Kopka:2004:GLT` are the keys for their respective documents. (The keys are defined in the BibTeX database file.) By making these citations, the bibliographic entries for these documents will be pulled from my BibTeX database and added to the bibliography automatically.

I can also add entries to the bibliography without having citations in my text by using the `\nocite{key}` command with the desired *key*. If I want every entry in my BibTeX file inserted into my bibliography, then I can issue the command `\nocite{*}` as a shortcut. (You don't have to worry about citations being redundant: bibliographic entries will be included only once no matter how many times they may be `\cite`d or `\nocite`d in your document.)

2.3 Alternative Citation and Bibliography Formats

The pre-formatted version of this document uses the default citation and bibliography formatting supplied by LaTeX and BibTeX. There are a few options to alter the appearance of citations and the bibliography. (See one of the references for your choices.) However, many disciplines and journals have created their own advanced BibTeX formatting styles, and you may want to use one of these in your document.

2.3.1 The natbib Package

The natbib package, activated by including `\usepackage{natbib}` in the document preamble, provides a common alternative to the default LaTeX bibliography and citation styles. Among other things, this package will allow you to make author–year citations in your document automatically (e.g., "Fargunkle et al., (2001)") without any changes to the BibTeX database file. In addition to the default LaTeX `\cite` macro, the package provides several new macros for creating citations in different contexts.

This document's driver file (`thesis.tex`) has options for trying out the natbib package. Look for the `\usepackage{natbib}` line near the top of the file, and then scroll down to the bibliography section for additional style selections you must specify for the bibliography itself. For a bibliography formatted according to the style of the Association for Computing Machinery, for example, you would issue the command `\bibliographystyle{acm}` before the `\bibliography` command. See [**?**] (or search the web) for more information on natbib.

2.3.2 The apacite Package

The APA (American Psychological Association) created another commonly-used style guide for citations and bibliographic formatting. The LaTeX package apacite was designed to follow the APA guidelines. The package provides its own set of macros for specifying citations in the document text,

but it also has a mode for compatibility with the popular natbib package. With this compatibility mode enabled, you may use natbib-style citation commands in your document to generate the APA-style citations and bibliography. In addition, using this compatibility mode means that you may switch between these two package alternatives without having to re-write the citations in your document.

If you use the apacite package, and if you have also enabled the hyperref package for your document, you *must* enable `natbibapa` compatibility mode, or citations will give you cryptic error messages when your document is processed. Load the package using the following line:

```
\usepackage[natbibapa]{apacite}
```

The corresponding bibliography style would be set by the following command line:

```
\bibliographystyle{apacite}
```

2.4 Even More Options

For those writing documents in the humanities or history disciplines, there are several other options you may want to consider. Because of limitations in the older BibTeX system, there is a move toward a newer system called biblatex. Bibliography styles based on this system use different citation commands and generate bibliographies in a different way.

For a comparison of the BibTeX and biblatex systems, the links below provide useful information. To use the biblatex package, you will have to customize the fsuthesis class to accommodate.

- http://tex.stackexchange.com/questions/25701/bibtex-vs-biber-and-biblatex-vs-natbib
- http://tex.stackexchange.com/questions/5091/what-to-do-to-switch-to-biblatex

2.4.1 The biblatex-chicago Package

While the natbib package provides an optional bibliography style that closely follows the so-called "Chicago style" (see [**?**]), the biblatex-chicago package provides many more features and stricter stylistic adherence over a wider range of types of references.

This package makes use of a new "back-end" processor called `biber` rather than the BibTeX program. The major TeX distributions already include the required programs. However, you may need to configure your environment to run `biber` rather than BibTeX to process your document.

2.4.2 The biblatex-historian Package

A historian package is similar to biblatex-chicago, but it is tuned for documents that require extensive footnote citations in the Turabian/Chicago styles. The user manual provides detailed descriptions of fields, citation commands, and plenty of examples. This package also requires the `biber` back-end processor.

CHAPTER 3

WORKING WITH GRAPHICS

In this chapter, we'll be dealing with the inclusion and placement of figures and other graphics in your thesis. Usually a figure will be a graphic of some type (e.g., a photograph, line drawing, chart) that resides in a separate file external to your document. You will need to decide on a format for these figures. If you are generating your own graphics using other programs, you may have the option to choose the output format. Otherwise, you may need to use other software to convert the graphic into a compatible format for inclusion in your LaTeX document.

3.1 Raster and Vector Graphics

Graphics for print media are generally in one of two classes: raster images or vector drawings. A JPEG photograph is an example of a raster format, where a matrix of pixels has a defined value. Raster images may be scaled up or down in size, but within limits. Scale such an image too large and it will become "pixelated" or blocky. Reduce the image too much, and finer details will be blurred or lost. If you use raster images in your thesis, they should be generated with a sufficiently high resolution that scaling artifacts will be minimized. For print media, a resolution of 300 to 600 dpi (dots per inch) might be typical. For viewing on screen, a minimum resolution of 100 dpi may be adequate. PNG, JPEG and GIF images are common examples of a raster type. PhotoShop, The Gimp, and other paint-type or photo-manipulation programs typically generate raster images. Scanning documents or other graphics will also generate a raster image of some kind, usually in one of JPEG, TIFF, or PDF formats.

In contrast, vector images will scale better. Vector images are usually line-drawings, text, and many kinds of graphs. Vector images can be scaled better because the pixel values are not defined until after the scaling occurs, so the image can be rendered at the full resolution of the output device, whether it be for print or screen. Also, vector images are often encoded in a much smaller space than a comparably-sized raster image. Adobe Illustrator, CorelDRAW, Inkscape, and Flash are examples of programs that generate vector images. WMF and SVG are also common vector

formats, though these types of files may not be included in your documents directly: they must be first converted to another file format.

In generating figures for your document, if you have a choice, choose a vector format, since it will provide the best scaling flexibility. (See figure **??** for an example of a vector drawing.) However, if you must include a photograph or scanned document of some type, then be sure that the raster image has a sufficiently high resolution for the intended publishing medium. (Figure **??** is an example of a JPEG raster image.)

3.2 The graphicx Package

The LaTeX package graphicx allows you to insert external PostScript or other files into your document. There are other figure-inclusion packages that you can use, but graphicx is probably the most commonly-used, providing several useful features for the task.

Using the MiKTeXor MacTeXpackages, you are probably using the `pdflatex` program to create a PDF document directly from the file sources. If you look back at this document's "driver" file `thesis.tex`, you'll find a line that says `\usepackage[pdftex]{graphicx}`. The option `pdftex` indicates that the graphicx package should employ the `pdftex` version of the driver to insert figures in a manner compatible with the pdfLaTeX processor. Using this driver, all of your external figures will need to be in PDF, PNG, JPEG, or GIF format. Other types of graphics files will need to be converted to one of these formats before they may be included in your document.

An alternative driver to `pdftex` is the option `dvips`, which will require all your figures to be in Encapsulated PostScript (EPS) format. Other formats will need to be first converted to PostScript. (Both PostScript and PDF formats may contain either raster or vector images, or even both at once.) This is the driver you should use if you are using the program `latex` instead of `pdflatex` to process your document. The DVI output from the `latex` program is later processed by the `dvips` program to convert the output to PostScript, which may then be converted to PDF. If you have lots of figures in PostScript format already, or if you will be using one of many LaTeX packages that creates PostScript figures, you may need to use this driver (and you probably know what you're doing already).

For the purposes of this sample document, the figures are provided in both EPS and PDF forms, so you may choose to use either the `latex` → `dvips` command chain, or `pdflatex` to process this

document. In fact, there's some fancy code in the `thesis.tex` file that chooses the right driver depending on whether you're running `pdflatex` or `latex` on these source texts.

3.3 PostScript, Encapsulated PostScript, and PDF

PostScript is a programming language for putting marks on a page. As such, PostScript files can usually be edited using plain text editors, should that ever be necessary. A file containing Encapsulated PostScript conforms to additional standards, allowing the graphic to be manipulated or included in other PostScript programs more readily.

As far as LaTeX is concerned, the most important feature of an Encapsulated PostScript file is the `%%BoundingBox`, which is defined as the smallest rectangle that completely encloses the figure. Two sets of x- and y-coordinates describe the bounding box; the first (x, y) pair gives the lower left-hand coordinates of box relative to the bottom left-hand corner of the page, and the second pair of coordinates identify the upper right-hand corner of the bounding box. You normally don't have to worry about this information at all, but if a PostScript figure does not contain `%%BoundingBox` information, or if the `%%BoundingBox` is incorrect, the `graphicx` package allows you to specify the bounding box coordinates yourself when you insert the figure into your document.

A PDF figure will have its dimensions embedded within it already, so you will not need to make any special preparations to include it in your document. PDF has a lot in common with PostScript, and the two formats may be converted from one to the other, usually without any loss in quality. Depending on your distribution of LaTeX, you may have a program already installed which converts EPS files to PDF. One of the simplest converters is the program `epstopdf`, which can be executed as follows:

```
epstopdf myfig.eps
```

A Windows version of this program might pop up a user interface for fine-tuning the figure conversion, while the Unix/Linux version of the program will simply do the conversion, creating `myfig.pdf` without any intervention required.

3.4 Inserting Figures

The basic mechanics of including a PostScript graphic (`dvips` driver) or PDF graphic (`pdftex` driver) are relatively simple:

`\includegraphics{figurefile}`

This command will insert the graphic contained in the file `figurefile` at that particular location in the text. The file name may have optional extensions, depending on the driver. For example, the `dvips` driver will recognize the `.ps` or `.eps` file extensions, while the `pdftex` driver will recognize extensions `.pdf` and `.jpg`. LaTeX will leave space for the graphic according to the bounding box information that the file contains.

For inclusion in your thesis or dissertation, a graphic will normally be labeled and given a caption. To do this, you will wrap the `\includegraphics` command in a `figure` environment. Figures will usually "float" from the location where they were defined. By default, LaTeX will try to place figures at the bottom of the current page (if there's sufficient room), then at the top of the next available page. Failing that, LaTeX will place figures onto their own page. The `\caption` command will number the figure automatically. If you need to refer to the figure in your text, include a `\label` command following the `\caption`, and then use the `\ref` and `\pageref` commands to retrieve the figure number and figure's page number, as required.

As a complete example, refer to Figure **??**. I used the following commands to include the figure graphic:

```
\begin{figure}
\begin{center}
\includegraphics[scale=0.6]{figs/fleur}
\end{center}
\caption{This is a simple figure, ...}
\label{ex-complete}
\end{figure}
```

In this case, the graphic file is located in the folder `figs`, and the complete file name is either `fleur.eps` or `fleur.pdf`. If I'm using the `dvips` driver, the `.eps` extension is added automatically; likewise, the `.pdf` extension would be added if I am using the `pdftex` driver. To center the graphic horizontally, I enclosed the `\includegraphics` command in a `center` environment. The `\caption` command handles text like this: a short, one-line caption will be horizontally centered, and a longer caption will be broken into multiple lines as required, with narrower margins.

At the beginning of the previous paragraph, I typed `Figure~\ref{ex-complete}` to retrieve the figure number. If I use this mechanism for all of the equations, tables, and figures in my

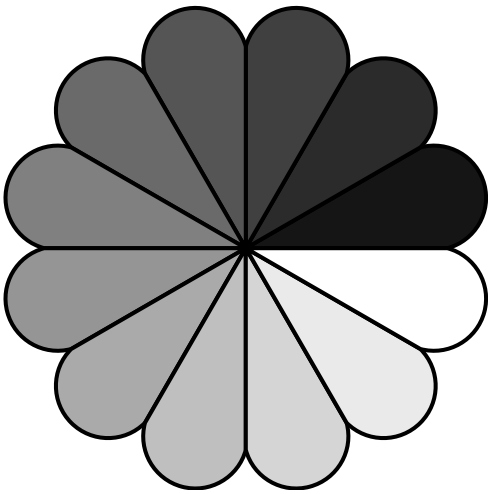


Figure 3.1: This is a simple figure, but a complete example. This figure is a vector drawing, so it may be scaled up or down without loss of precision.

manuscript, I never have to worry about renumbering anything should I choose to move blocks of text or figures around. I can also state that Figure **??** will be found on page **??** by typing

```
Figure~\ref{ex-complete} will be found on page~\pageref{ex-complete}
```

The `\includegraphics` command has several optional arguments which will allow you to adjust figure position, bounding box, rotation, scaling, and other elements, without having to edit the figure itself. Figure **??** displays an image in its raw state, and then a close-up, rotated image of a segment of the same PostScript graphic. A complete description of the all the options available is best left for the graphicx package manual page, but the transformed image was accomplished with the following `\includegraphics` line:

```
\includegraphics[viewport=.9in 2.1in 1.15in 2.35in,clip,
    scale=10.67,angle=90]{figs/ben}
```

3.5 Inserting Forms or Full-Page Figures

If you need to include a copy of an approval form or certification in your document, you can take advantage of a few additional options of the `\includegraphics` command to allow the figure to occupy most of the page. If you already have an electronic version of a full-page form, you can eliminate some of the white space border of the page before insertion to reduce the amount of

Figure 3.2: Benjamin Franklin, in raw form (left), and close-up and rotated (right). (Notice that the close-up figure displays "pixelation" effects of a raster image scaled too large.)

scaling required. As an example, the file `rights` in the `figs` folder is a full page of text with 1-inch borders on all sides. I can tell `\includegraphics` to trim this space and fill the rest of the page with a command like this:

```
\includegraphics[trim=1in 1in 1in 1in, clip,
    height=\textheight]{figs/rights}}
```

The `trim` and `clip` options remove the whitespace border. The `height=\textheight` command stretches or compresses the figure to the full text column height, allowing room for the page number. On the other hand, if the full-page image needs a caption, you'll need to reduce the scale a bit more to fit it in. In addition, I could draw an outline around the figure with an `\fbox` command to give it a page-within-a-page appearance. In this case, I might want to leave a small amount of whitespace around the text of the inserted page. Making these modifications and leaving a bit of room for the caption gives us the commands below. You can see the results on page **??**.

```
\begin{figure}
\fbox{\includegraphics[trim=.9in .9in .9in .9in,clip,
        height=7.8in]{figs/rights}}
\caption{The Bill of Rights}
\label{fig:rights}
\end{figure}
```

The Bill of Rights

Amendment I

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

Amendment II

A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed.

Amendment III

No Soldier shall, in time of peace be quartered in any house, without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law.

Amendment IV

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Amendment V

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger; nor shall any person be subject for the same offence to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.

Amendment VI

In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the Assistance of Counsel for his defence.

Amendment VII

In Suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury, shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law.

Amendment VIII

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

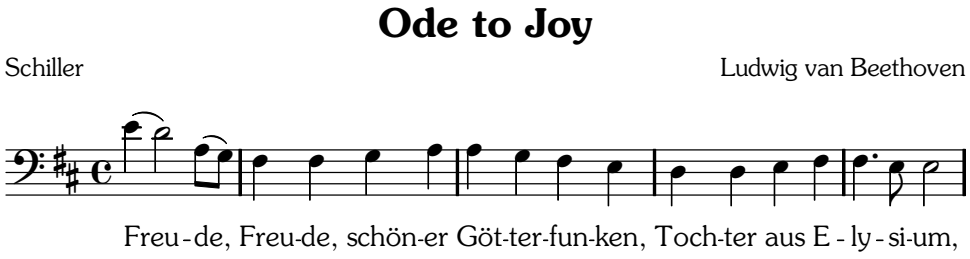
Amendment IX

The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.

Amendment X

The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

Figure 3.3: The Bill of Rights



Example 3.1: The bass soloist's opening statement in the 9th Symphony.

3.6 Musical Examples

If your thesis or dissertation requires you to include musical examples, the fsuthesis class has an environment already set up for you. Each musical example should be in its own PostScript EPS file or PDF file (depending on the graphicx driver you are using). Then, rather than using the `figure` environment, you would use the `musex` environment as demonstrated here to create Example **??**:

```
\begin{musex}
\begin{center}
\includegraphics{figs/freude}
\end{center}
\caption{The bass soloist's opening statement in the 9th Symphony.
  \label{mus:bass-ode}}
\end{musex}
```

As with figures, the caption follows the graphic. However, the caption will be automatically titled with "Example" rather than "Figure". If your document contains more than one musical example, they can be listed in their own table by using the command `\listofmusex` in the front matter section of your document.

3.7 Further Information

This chapter intended to provide a brief overview of figure inclusion, along with a few simple examples. If your figure-insertion needs have not yet been addressed, you should look up the document *Using Imported Graphics in LaTeX and pdfLaTeX* by Keith Reckdahl, which is part of the Comprehensive TeX Archive Network (CTAN). This document provides a wealth of detail about figure manipulation, insertion, and placement.

In addition to the inclusion of external figures, LaTeX provides several environments and packages for creating figures mathematically (usually technical line-drawings) within a LaTeX document itself. Investigate the picture package and its extensions epic and eepic. Other figures and text manipulations can be carried out with the pstricks package. The program METAPOST can generate precise renderings of mathematical objects and diagrams. And there are many more utilities and packages to assist you.

CHAPTER 4

TABULAR DATA AND TABLES

Most graduate students will come to a place in their career where they must create a table of some kind. Many simple layouts are a breeze with LaTeX. Here's a brief example:

1	a	3^1	3
2	abb	3×3^2	27
33	abbccc	$3^3 \times 3^3 \times 3^3$	19683

and the source text that created it:

```
\begin{tabular}{ r r || c | l }
  1  & a      & $3^1$                          &     3 \\
  2  & abb    & $3\times 3^2$                  &    27 \\ \hline
  33 & abbccc & $3^3 \times 3^3 \times 3^3$ & 19683 \\
\end{tabular}
```

When the `tabular` environment begins, the next required parameter specifies the layout of the table. In this case, the table layout specifies two right-justified columns (`r r`), a double-vertical separator (`||`), a centered column (`c`), a single-vertical separator (`|`), and a left-justified column (`l`). The next rows provide the data for the table, with columns separated by the ampersand (`&`) character. The end of the row is indicated by the double backslash (`\\`). As you can see, the columns may contain text, numeric data, and even some math. A horizontal line may be drawn between rows using the `\hline` command. As always with LaTeX, multiple spaces within columns are ignored. In addition, LaTeX also ignores spaces immediately following the `&` character.

For many people, this may be all the information on tables that's required (for now, anyway). But at some point, you may need even more options to create just the right layout. There are several additional packages that add functionality to LaTeX's table-formatting capability. A quick web search for `latex table` will turn up a wealth of usable information, samples, examples, packages, and tutorials.

The `tabular` environment provides the layout mechanism for placing text and data into row and column form. But it's the `table` environment that allows you to automatically number your table and to add a heading (caption). The `table` environment works just like the `figure` environment

as far as floating placement is concerned. However, the FSU thesis guidelines state that table captions should appear *before* the table, while `figure` captions appear *after* the figure. The text in Figure **??** generates Table **??** as an example. (And I used `Table~\ref{sonnets}` in the previous sentence to retrieve the table number.) This demonstrates how one can create paragraphs of text as part of a table by using the `p{5cm}` format specifier. Additional space was inserted after each row by adding a dimension to the linebreak specification, i.e., `\\[5pt]`.

However, just because you put some text or data into a multi-column form, it doesn't necessarily mean that it's a table as far as your thesis or dissertation is concerned. If the tabular-form data is part of your text and flows in the order of your presentation, it may not be necessary to set it off as a table. The layout example at the beginning of this chapter is an example of tabular data which is not set off as a table.

Other than the unfortunately confusing similarity in their names, the `tabular` environment and the `table` environment have independent functionality: while the `tabular` environment is often used inside the `table` environment, either environment can be used without the other. And while we're at it, figures don't necessarily need to contain graphics. Figure **??** is an example of a figure which contains ordinary text, but the text has been wrapped within a `figure` environment so that it can be allowed to float outside the main flow of text.

If you have a particularly wide table, you may want to turn the table sideways on the page. To do this, add `\usepackage{rotating}` to the document preamble. When it is time to insert the rotated table, type `\begin{sidewaystable}` instead of `\begin{table}`. This also works for figures, by the way, so instead of `\begin{figure}`, you may use `\begin{sidewaysfigure}` for diagrams and images that you want rotated. Sideways figures and tables will always be floated to their own page.

```
\begin{table}
\caption{Shakespeare Sonnets, First Lines, IIX --- XII}
\label{sonnets}
\begin{center}
  \begin{tabular}{r p{5cm} }
    8 & Music to hear, why hear'st thou music sadly? \\[5pt]
    9 & Is it for fear to wet a widow's eye \\[5pt]
   10 & For shame deny that thou bear'st love to any \\[5pt]
   11 & As fast as thou shalt wane, so fast thou grow'st \\[5pt]
   12 & When I do count the clock that tells the time \\
  \end{tabular}
\end{center}
\end{table}
```

Figure 4.1: LaTeX source that generates Table **??** on page **??**.

Table 4.1: Shakespeare Sonnets, First Lines, IIX — XII

8	Music to hear, why hear'st thou music sadly?
9	Is it for fear to wet a widow's eye
10	For shame deny that thou bear'st love to any
11	As fast as thou shalt wane, so fast thou grow'st
12	When I do count the clock that tells the time

APPENDIX A

GOOD TIME HAD BY ALL

This appendix is here merely to demonstrate how appendices may be included and formatted in your document. Look through the files `thesis.tex` and `appendix.tex` to see how these pieces work together.

BIOGRAPHICAL SKETCH

The author was born, and then the author was "educated," at least to some degree. After finishing high school in Florida, the author completed a Bachelor of Arts degree at Florida State University. Following a decade in the work force in his discipline, the author returned to FSU to pursue graduate work.