Writing Notes, Week 3

- Quotation marks.
- Aligning equations.
- Use of passive voice.
- Never start a sentence with a variable name.
- Functions versus variables: `\sin`, `\cos`, etc.
- Be sure and use the figure environment when putting in figures.
- Be sure figure captions state what we should be looking at.
- Do not say "See figure below". In LaTeX, write `See Figure \ref{LabelName}`.

New Maple Commands: Week 3

This week, we see that there are two types of integral that Maple can work with- `int` and `Int`. After considering the differences, we then look at plotting and options for a plot.

- Special Functions: Since Maple tries to output **exact** values and not numerical approximations, it uses "special functions"- These are functions that cannot be expressed as a finite sum of elementary functions, but they are so useful, that Maple will use them frequently.

  For a list of Maple functions, type: `?initialfunctions`. One function that we see quite regularly is the so-called "error function", or `erf`. If you see a function named being used by Maple and you're not sure about it, use Maple's help. For example:

  ```
  ?erf
  ```

- Integration: In Maple, the general form for an integral is:

$$\int_a^b f(x)\,dx \qquad \Leftrightarrow \qquad \texttt{int(f,x=a..b);}$$

  where $f(x)$ is an **expression** in x. If we do not want Maple to try to determine an antiderivative, we can use the "inert" form of the integral (`Int`). For example, compare the results:

```
F:=exp(-t^2);
G1:=int(F,t=-1..2);
G2:=Int(F,t=-1..2);
evalf(G2);
```

- Extra options in a plot:
  - We can change the way the tick-marks are set. Here's an example:
    Plot $y = \sin(x)$ for x between -10 and 10. Use 6 tickmarks on the $x-$axis and 10 tickmarks on the $y-$axis:

    ```
    plot(sin(x),x=-10..10,tickmarks=[6,10]);
    ```

  - We can label the tickmarks any way we want. Here's an example:
    Plot $y = \sin(x)$, for x between -6 and 6. Label the $x-$axis for each maximum as A, B, C, etc. The line break is for readability. In this case, we use the default markings for the $y-$axis.

    ```
    plot(sin(x),x=-6..6,tickmarks=[[-3*Pi/2="A", -Pi/2="B", Pi/2="C",
         3*Pi/2="D"],default]);
    ```

  - We can include a legend on the plot- We should do that if we have more than one function. We can also label the axes and change the colors of the functions.
    Example: Plot $\cos(5x)$ and $\sin(x)$ using red and blue respectively, change the viewing window to $0 \leq x \leq 3\pi$ and $-3 \leq y \leq 2$, label the axes as "Axis 1", "Axis 2" (respectively), and make the legend read "Function 1" and "Function 2". The tickmarks are a little squeezed together. We can respace them with the command below. The line breaks are for readability only (not needed in Maple).

    ```
    plot([cos(5*x),sin(x)],x=0..3*Pi,view=[0..3*Pi,-3..5],
          legend=["Function 1","Function 2"],
          labels=["Axis 1","Axis 2"],
          color=[red,blue],
          tickmarks=[spacing(Pi),default]);
    ```

- Plotting two functions in 2-D versus plotting one parametric set of functions.
  Try the following two commands, and note the difference- One command plots two separate functions, one command plots a single parametric plot.

  ```
  plot( [ sin(x), cos(sqrt(2)*x)], x=0..10*Pi);

  plot( [ sin(x), cos(sqrt(2)*x), x=0..10*Pi]);
  ```

New Writing and LaTeX Discussion

In writing up the solution to the lab questions, use section and subsection (and if needed subsubsection) headings. You should label any figures used, and reference them in the text (See the handouts from Week 2).

When typesetting mathematics, keep in mind whether or not the expression should be "inline" or "display math" mode.