Homework Template[1]

Q1

The answer to problem 1 goes here.
You can have multiple paragraphs or bulleted lists:

- item 1
- item 2
- item ...

Q2

The answer to the second question goes here.
It also can have a 2nd paragraph and a enumerated list:

(a) first item
(b) second item
    i. sub item

Q2(a)

Here is another subproblem to answer.

LaTeX Basics

This a brief review of some of the functionality you may use, please consult the resources provided for additional examples or help!

Line breaks in LaTeXmust be explicit like
this.
Not, like this which does not produce a line break.
Text can be

centered.

Different kinds of emphasis including *italics* or *emphasis* or *emphasis*, **bold** or **bold**, underline, `teletype`, Small Caps.
Math can be easily embedded with in text like the following equation: $f(n) = n^2 - 2$. Longer or more important formula can be set into separate equations from the text

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}.$$

The formula is displayed differently inline: $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$.
A command or symbol used in text mode may not work in math mode and vice versa. If you want to include text while in math mode use the `\text{ }` command:

$$a = b \text{ or } c \neq d$$

If you are using quotation marks, make them using the following format: "smart quotes".

Symbols and Math

A command in LaTeXis indicated by the backslash character - \. Other characters are protected so for them to appear you need to add the backslash before it:

$ % & { } _

[1]Template inspired by: CS22 @ Brown University and `https://github.com/jdavis/latex-homework-template`

Some basic math commands that may be useful:

$$\frac{8}{23} + \sqrt{i+4} - \binom{12}{8}$$

If you have a complicated formula, you may want to use the left and right parentheses that expand to fit the expression

$$f(n,m) = \left(\frac{1}{n}\right) - \left(\frac{1}{1+\frac{1}{m}}\right).$$

Superscript and subscript:

$$10^2 \quad n^{n^2} \quad x_1 \quad n_{1,1}$$

Other useful commands for this course, sets:

$$\in \quad \notin \quad \emptyset \quad \subseteq \quad \subset \quad \cup \quad \cap \quad \not\subseteq \quad \{x \in \mathbb{N} \,|\, 2 \leq x \leq 6\}$$

Special sets:

$$\emptyset \quad \mathbb{N} \quad \mathbb{Z} \quad \mathbb{Q} \quad \mathbb{R}$$

Logic commands:

$$\neq \quad \wedge \quad \vee \quad \oplus \quad \rightarrow, \Rightarrow \quad \leftrightarrow, \Leftrightarrow \quad \equiv \forall \quad \exists$$

If you are working through a proof or need to display multiple equations, then there is the `align` math environment

$$\begin{aligned}
a_n &= a_{n-1} - n && (1)\\
&= a_{n-2} - (n-1) - n = a_{n-1} - (n + (n-1)) && (2)\\
&= a_{n-3} - (n-2) - (n + (n-1)) = a_{n-2} - (n + (n-1) + (n-2)) && (3)\\
&= \cdots && (4)\\
&= 4 - (n + (n-1) + (n-2) + \ldots + 1) = 4 - \frac{n(n+1)}{2} && (5)
\end{aligned}$$

If you do not want the equations numbered use the `align*` environment.

$$\begin{aligned}
\sum_{i=4}^{n} 7 \cdot 5^i &= \sum_{j=0}^{n-4} 7 \cdot 5^{j+4} && \text{(change of index)}\\
&= \sum_{j=0}^{n-4} 7 \cdot 5^j 5^4 && \text{(algebra)}\\
&= 7 \cdot 5^4 \sum_{j=0}^{n-4} 5^j && \text{(Fact 4)}\\
&= 7 \cdot 5^4 \left(\frac{5^{n-3}-1}{4}\right) && \text{(Table 2.1)}
\end{aligned}$$

Tables and Figures

Tables are generally defined with the `tabular` environment.

$p \vee (q \to r)$

p	q	r	$q \to r$	(d)
T	T	T	T	T
T	T	F	F	T
T	F	T	T	T
T	F	F	T	T
F	T	T	T	T
F	T	F	F	F
F	F	T	T	T
F	F	F	T	T

To automatically number a table and add a caption also use the `table` environment and `caption` command. The number can then be used to reference specific tables in the text, e.g., Table 1.

$\neg$	negation	the negation, or "not" operator, is a unary logic operation
$\wedge$	conjunction	the conjunction, or "and" operator, is a binary logic operation
$\vee$	disjunction	the disjunction, or "or" operator, is a binary logic operator

Table 1: Description of Logic Operators

Images can be added using the `includegraphics` command

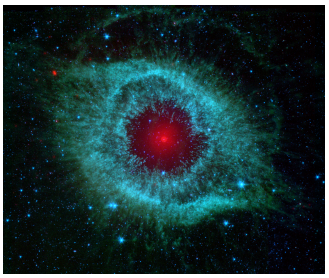

Figure 1: Nebula, credit: NASA images

Code / Pseudo-code

Code or pseudocode can be added to a .tex document using the `listings`.

```
1  fruitPrices = {'apples':2.00, 'oranges': 1.50, 'pears': 1.75}
2
3  def buyFruit(fruit, numPounds):
4      if fruit not in fruitPrices:
5          print "Sorry we don't have %s" % (fruit)
6      else:
7          cost = fruitPrices[fruit] * numPounds
8          print "That'll be %f please" % (cost)
9
10 # Main Function
11 if __name__ == '__main__':
12     buyFruit('apples',2.4)
13     buyFruit('coconuts',2)
```

Actual Code Chunk

An actual R code chunk to produce output is shown here.

```
> rm(list = ls()) # Taken from: https://stat.ethz.ch/pipermail/r-help/2007-August/137694.html
> library(ggplot2)
> library(plyr)
> library(stats)
> library(stringi)

> # Example for R Examples introD.Rmd file.
>
> se <- function(x) {
+   v <- var(x)
+   n <- length(x)
+   return(sqrt(v/n))
+ }
> se(c(45, 2, 5, 8, 65, 4))

[1] 10.93237

> for (i in 1:10) {
+   print(i^2)
+ }

[1] 1
[1] 4
[1] 9
[1] 16
[1] 25
[1] 36
[1] 49
[1] 64
[1] 81
[1] 100

>
```