

Math 291  
Week 7 Lab

**Instructions:** Use  $\text{\LaTeX}$  to typeset a document containing each component described below. Turn in your lab by emailing it to jamesju@mnstate.edu or by uploading it to the appropriate assignment folder on the course D2L page. You should email both your raw TeX (.tex) file and your compiled document (in either .ps or .pdf form). Make sure that your name appears somewhere in your file name. You will be graded on both your raw TeX code and the accuracy of your compiled document. This lab is due by 5:00pm on Friday, March 17th.

1. Make sure to load the “amsthm” package in the preamble of your document.
2. Use the  $\backslash\text{newtheorem}$  command to define an enumerated theorem environment, an enumerated axiom environment, and any others as needed.
3. Use a combination of enumerate (you may need to manually set the enumeration counter) and environment commands (including the proof environment) to produce the following:

**Theorem 3.1.** *A sheet of writing paper is a lazy dog.*

*Proof.* A sheet of paper is an ink-lined plane. An inclined plane is a slope up. A slow pup is a lazy dog. Therefore, a sheet of writing paper is a lazy dog.  $\square$

**Theorem 3.2.** *A peanut butter sandwich is better than eternal happiness.*

*Proof.* A peanut butter sandwich is better than nothing. But nothing is better than eternal happiness. Therefore, a peanut butter sandwich is better than eternal happiness.  $\square$

**Theorem 3.3.** *Every horse has an infinite number of legs.*

*Proof.* Horses have an even number of legs. Behind they have two legs, and in front they have fore legs. This makes six legs, which is certainly an odd number of legs for a horse. But the only number that is both odd and even is infinity. Therefore, horses have an infinite number of legs.  $\square$

**Theorem 3.4** (B.I.G. Theorem). *The less knowledge you have the more problems you have.*

*Proof.* From physics we know that  $\text{Power} = \frac{\text{Work}}{\text{Time}}$ .

It is well known that  $\text{Knowledge} = \text{Power}$  and that  $\text{Time} = \text{Money}$ . So we have that  $\text{Knowledge} = \frac{\text{Work}}{\text{Money}}$ . Solving for Money gives us

$$\text{Money} = \frac{\text{Work}}{\text{Knowledge}}.$$

We observe that as  $\text{Knowledge} \rightarrow 0$ , we have that  $\text{Money} \rightarrow \infty$ .

It is also well known that  $\text{Mo Money} = \text{Mo Problems}$ . So  $\text{Knowledge} \rightarrow 0$  implies  $\text{Problems} \rightarrow \infty$ .  $\square$

4. Continue using appropriate environments to create the following:

**Axiom 4.1.** *If an animal is carnivorous, then it prowls at night.*

**Axiom 4.2.** *If an animal loves to gaze at the moon, then it is suitable for a pet.*

**Definition 4.1 (Nurse).** *A person who wakes you up to give you sleeping pills.*

**Definition 4.2 (Lecture).** *The art of transferring information from the notes of the Lecturer to the notes of the students without passing through the minds of either.*

**Definition 4.3 (Compromise).** *The art of dividing a cake in such a way that everybody believes they got the biggest piece.*

5. Use `\newcommand` to define a command that accomplishes each of the following. Perform two sample calculations with each one.

(a) Create a command which, when given as input 2 real numbers, outputs an algebraic expression that uses the first number as a base and the second number as an exponent.

(b) Create a command which, when given as input 4 real numbers, it outputs an algebraic expression representing the mean of the four numbers.

(c) Create a command which typesets an expression of the form  $\sum_{i=k}^n \frac{i+1}{i^2}$ , and which allows the user to input specific values for  $k$  and  $n$ , but that defaults to a value of  $\infty$  for  $n$  if no value is input.

(d) Define your own command. Make sure that it has at least 3 inputs and at least two operations. If you are especially creative, I may award a small amount of extra credit.