1. Homework and Notes on the Web

The code books for the homework will come into the bookstores today and tomorrow.

Remember, your homework is worked at the address

http://phga.pearsoncmg.com/phga/classes/Math220DFall06/

Notes for the course are posted at

http://www.math.uiuc.edu/~loeb/math220/

2. Advice on entering homework answers

1) Always provide exact answers unless asked for an approximation, even if the sample answer is given as an approximation.

2) Use the preview function.

3) Don't change the name of a variable in a problem.

4) For an odd root of a negative number, put the minus sign in front. That is, write -(8)^(1/3) and not (-8)^(1/3).

5) Use abs() for the absolute value function.

3. Homework due Tuesday, August 29, 9 a.m.

Section 1.1: #12, 14, 26, 28, and 36.

Section 1.2: #4, 6, 10, 20, and 26.

The numbers in some of the problems for your homework will be different than the ones in the book. Each person that takes the course is given problems with numbers that usually change from person to person. Also the your numbers will be different than the ones in the sample problems.

4. Written Homework for next week

Find the slope, the y-intercept, and equation of the line through the points $(1, 4)$ and $(5, -3)$.

5. Note on Proofs

From time to time, I will ask you for some simple proofs. You should not start with the conclusion and work backwards. Here is an example showing that such reasoning can lead to a false result. I will use this bad reasoning to show that $1 = -1$: $1 = -1 \Rightarrow (1)^2 = (-1)^2 \Rightarrow 1 = 1$, which is true.

6. Functions

We review the notion of a function. For us, a function will always give a real number as an output. The **domain** of the function is the set of numbers for which an output is defined. The **range** is the set of outputs. There can be only one output defined for each input. This means a vertical line meets the graph of a function at most once. One can say that a function is the rule that assigns the output to an input, or more generally, it is the set of all ordered pairs (x, y) where x is in the domain and y is the unique output associated with x. We call x the **independent variable** and y the **dependent variable**. If we call the function f, then we write $f(x)$ for the output. For example, if f is the squaring function, then we can write $f(x) = x^2$. Often, one speaks of the rule, such as $f(x) = x^2$ as the function.

If not otherwise specified, the domain of a function is the largest set for which the rule gives a real number output. For the function $f(x) = \sqrt{25 - x^2}$, for example, the domain is the interval $[-5, 5]$. For the function $f(x) = 1/\sqrt{25 - x^2}$, for example, the domain is the interval $(-5, 5)$. You should review the notation for intervals on page 4 of your text.

7. FUNCTIONS OF SEVERAL VARIABLES

Often, you are given the output as a function of two independent variables, but you are given other information that allows you to write one of the independent variables as a function of the other, and thus lets you to reduce the number of input variables. Here is an example: A rectangle has perimeter 100 inches, with height y and base x inches. Find the area A as a function of the base x. We know that $A = xy$, and $100 = 2x + 2y$. This means that $y = 50 - x$, and $A = x(50 - x)$.

8. ABSOLUTE VALUE

An important example of a function is the **absolute value** function. Recall that $|a| = a$ if $a \geq 0$ and $|a| = -a$ if $a < 0$. This means that $|a|$ is the distance of a from 0. We also have $|a| = \sqrt{a^2}$.

Given an inequality involving a variable such as x, you often want to know what points on the real line $\mathbb{R}$ satisfy the inequality, i.e., make it true. Often the inequality will involve an absolute value. Now, $|a| \leq c$ iff $-c \leq a \leq c$. So $|x - b| \leq c$ iff $-c \leq x - b \leq c$, or $b - c \leq x \leq b + c$. This means that x can get at most a distance c from b.

The **triangle inequality** says $|a + b| \leq |a| + |b|$. We have $|a + b| = |a| + |b|$ if and only if a and b have the same sign. The inequality is named "the triangle inequality" because the same inequality holds for the length of line segments forming a triangle using the appropriate definition of addition.

An immediate corollary of the triangle inequality is

$$||a| - |b|| \leq |a - b| .$$

This follows since $|a| = |a - b + b| \leq |a - b| + |b|$, and the same is true with the roles of a and b reversed.