College Algebra Notes

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Fall 2011

1 Some Things To Know About This Course

1.1 The Syllabus

The syllabus is located at www.ms.uky.edu/∼ma109. It is a contract between you and your instructor. Read it. Reference it. You are responsible for everything in the syllabus even if your instructor does not remind you about its contents.

Make a calendar for the school year. Include important dates, times, and locations.

Cheating is described in the syllabus. Do not do it.

1.2 Reading Mathematics Textbooks

You are expected to read your textbook **BEFORE** coming to class.

Mathematics is read slowly. It may take you as long or longer to read three pages in a mathematics book as it takes you to read an entire chapter in a history book. Take notes as you read. Write important definitions and theorems. Write examples. Make sure you understand each step. If you have questions, make a note to ask them during class, recitation, or office hours.

As you read, look for problems in the exercises that are similar to the examples you have read. Try to solve the exercises.

You should also read the textbook again **AFTER** lecture.

1.3 Homework

Do your homework **early**. If you do your homework early, you have time to **Ask Questions**.

Before an exam, make sure that you can do every homework problem without looking at your book, without looking at your notes, and without consulting anyone else. Do homework problems until you are confident that you **UNDERSTAND** them.

You will have online assignments and written assignments. Your online homework assignments will be due most Mondays and Thursdays at 11:59pm. You will have four written assignments to turn in, each due at the beginning of class the day of each exam or the last day of class.

1.4 Learning in College

College is different than high school. You need to:

1. Study continually.

2. **Regularly** Review.

3. Learn both **CONCEPTS** and **PROCEDURES**.

Knowing how to solve a problem is not sufficient in college. You need to know why each step in the solution is valid. If you do not understand a concept, ASK! If you still do not understand a concept, ASK AGAIN!

DO NOT Cram. Mathematics takes time to learn. Instructors and Tutors cannot help you learn the concepts if you wait until the day before the exam to study. Instructors and Tutors are very busy on the day before the exam and on exam day.

1.5 Help!

Where can you go to find help?

1. I hold office hours. Check the syllabus for times and locations.

2. The Mathskeller (CB 065). Take an elevator to the basement of Patterson Office Tower. At the candy machines, turn left. Go down a very long hallway until you reach the red doors. Enter the red doors.

3. Academic Enhancement (The Study) is located in the Commons on south campus.

2   A Bit of Review

2.1   Order of Operations

In an expression without parentheses, exponents are performed first. Then multiplication and division are performed (from left to right). Addition and subtraction are performed last (from left to right).

Example 2.1
Simplify the expression $-3^2 + 1$.

$$-1 \cdot 3^2 + 1 = -1 \cdot 9 + 1 = -9 + 1 = -8$$

If an expression contains parentheses,

- Do all computations inside the parentheses before doing any computations outside the parenthese.

- When dealing with parentheses within parentheses, begin with the innermost pair and work outward.

Example 2.2
List the order in which operations are being applied to x.

$$2(x^3 - 5) + 1$$

1. cube

2. subtract 5

3. multiply by 2

4. add 1   3

Example 2.3
List the order in which operations are being applied to a.

$$b^3 - 2a = b^3 + -2a$$

1. multiply by -2
2. add b^3

2.2 Square Roots and Principal Square Roots

Definition 2.4

If $x^2 = y$, then x is **a square root of** y.
If $x^2 = y$ and x is **non-negative**, then x is **the principal square root of** y and we write $x = \sqrt{y}$.

Example 2.5 (Square Roots)
All of the following are true.

(a) 3 is a square root of 9.

(b) -3 is a square root of 9.

(c) 3 is the principal square root of 9.

(d) $\sqrt{9} = 3$

Example 2.6 (Do you understand square roots?)
What is $\sqrt{4}$?

(a) 2

(b) -2

(c) Both 2 and -2

(d) 16

(e) -16

(f) Both 16 and -16

> **Property 2.7**
>
> $$\sqrt{ab} = \sqrt{a}\sqrt{b}$$

Example 2.8 (Can you simplify square roots?)
Simplify.

1. $\sqrt{720}\sqrt{5}$ $= \sqrt{3600} = \sqrt{36}\sqrt{100} = 6 \cdot 10 = 60$

2. $\sqrt{1792} + \sqrt{7}$ $= \sqrt{256}\sqrt{7} + \sqrt{7} = 16\sqrt{7} + \sqrt{7} = 17\sqrt{7}$

2.3   Negation

If x is positive, then $-x$ is _negative_

If x is negative, then $-x$ is _positive_.

The negative of $5 - x$ is _$x - 5$_.

$-(5-x) = -5 + x = x - 5$

The negative of $x - y$ equals _$y - x$_.

$-(x-y) = -x + y = y - x$

Example 2.9 (Do you understand negative numbers?)
Which of the following is positive?

(a) $\pi - 2$ $\pi \approx 3.14$ so $\pi - 2$ is positive

(b) $\sqrt{7} - 3$ $\sqrt{7}$ is less than $\sqrt{9} = 3$ so $\sqrt{7} - 3$ is negative.

Example 2.10 (Do you understand negation?)
Find the **exact** value.

(a) $-(\pi - 2) = 2 - \pi$

(b) $-(\sqrt{7} - 3) = 3 - \sqrt{7}$