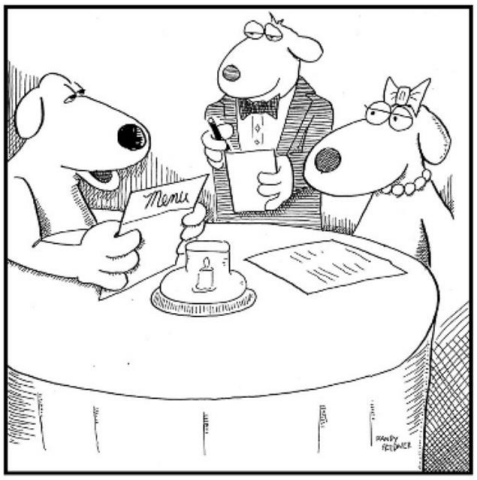
# HOMEWORK: MATH 201

## SPRING 2020




"I'll have the math homework."

**Homework 0:** Due: Thursday, 16 January 2020

Briefly relate (in one or two paragraphs) information about yourself that will help me get to know you. If you wish, you may let the following questions serve as a guide: Which other courses in math have you taken or are taking concurrently with Math 201. Why have you chosen to take Math 201 now? (for example: *"major requirement," "minor requirement," "just for fun because I love mathematics," "nothing else fits my schedule," "my parents forced me to take this course," "I am looking for an easy A to raise my GPA"*); what is your major?; what is your career goal?; what has been the nature of your previous experience with math either in high school or in college (that is, have you enjoyed math in the past?).

(Please post your response as a *private* message in Piazza no later than midnight, Thursday. For "Subject," write "**201 Homework 0**". Thank you.

**Homework 1:** Due: Tuesday, 21 January

Read sections 1.1 through 1.5 of Hammack. Note that all of Hammack's odd exercises have solutions at the end of the book. So you would profit by doing many of the exercises in these sections and, if you wish, check your answers.

- Solve exercises 1.1/A8, 10; B18, 22; C 30, 32, 34; D40, 42; section 1.2/A2, 4, 6; section 1.3/ A2, 4, 6
- Explain why each of the following sentences is ambiguous.

  **a.** Assume you wish to increase your wealth, would you rather be paid $400 weekly OR $400 biweekly?
  **b.** Did you see her duck?
  **c.** This is a good sign!
  **d.** We don't just serve hamburgers; we serve people.
  **e.** Slow children at play.
  **f.** Automatic washing machines. Please remove all your clothes when the light goes out.
  **g.** Please wait for the hostess to be seated.

Note: Staple the pages together. Write legibly.

**Homework 2:** Due: Friday, 30 January

Read sections 1.6 through 1.9. Section 1.10 is optional reading.

Prepare for Thursday's short quiz that will cover sections 1 – 7.

**(1)** Solve the following exercises: section **1.4** / A 8, B 16, 20; section **1.5** / 2f, 3adg, 4h, 6, 8, 10; section **1.6** / 2 aef; section **1.7**/ 10, 14 ; section **1.8**/ 2, 10ab

**(2)** Let X = {0, 1, 2, 3, 4, 5, 6}

**a.** Find |X|

**b.** Define a function S on P(X) as follows:
For $A \in P(X)$, let S(A) be the sum of all the elements of A.
For example $S(\{3, 5, 6\}) = 14$.
Define Y = $\{A \in P(X) | S(A) = 5\}$.
List all the elements of Y. Find |Y|.

**(3)** Let A, B, and C be subsets of the set S. Using only the operators for the union, intersection, difference, and complement as well as the letters A, B, and C, write down expressions for each of the following subsets of S.

(A*nswers are not unique.)*

**a.** at least one subset
**b.** only subset A
**c.** A and B but not C
**d.** all three
**e.** none of the three
**f.** *exactly* one subset
**g.** *at most* two subsets
**h.** *exactly* two subsets

For example: "exactly 2 subsets" would be represented by

$(A \cap B \cap \bar{C}) \cup (B \cap C \cap \bar{A}) \cup (A \cap C \cap \bar{B})$ Note: Additional parentheses are not needed since the intersection is associative.


**Homework 3:** Due: Friday, February 7

Read sections 2.1 through 2.8. If time permits, read all of chapter 2.

Prepare for next Thursday's short quiz that will cover chapter 2.

**1.** (a) In propositional logic, ***modus ponendo ponens*** (Latin for "the way that affirms by affirming"; generally abbreviated to **MP** or ***modus ponens***) or ***implication elimination*** is a rule of inference. It can be summarized as "$p$ implies $q$ and $p$ is asserted to be true, so therefore $q$ must be true," viz, $(p \wedge (p \Rightarrow q)) \Rightarrow q$. The history of *modus ponens* goes back to antiquity. Using a truth table, prove *modus ponens*.

(b) Using a truth table prove that $\sim(p \Rightarrow q)$ *is logically equivalent to* $p \wedge \sim q$.

(c) Consider the two sentences $\mathcal{A}$ and $\mathcal{B}$ defined by:

$\mathcal{A}$: $(p \wedge q) \Rightarrow r$
$\mathcal{B}$: $p \Rightarrow (q \Rightarrow r)$

$(i)$ *Does* $\mathcal{B} \Rightarrow \mathcal{A}$?
$(ii)$ *Does* $\mathcal{A} \Rightarrow \mathcal{B}$?
*(Of course, use truth tables to answer these questions.)*

*(d) Negate each of the following sentences. Hint: Use 3 (b).*

$(i)$ $a \Rightarrow b \wedge c$

$(ii)$ $(a \wedge b) \vee (a \wedge b)$

$(iii)$ $(a \wedge b) \Leftrightarrow (\sim a \vee \sim b)$

$(iv)$ $(a \Rightarrow b) \Rightarrow (\sim c \Rightarrow (b \Rightarrow a)$

**2.** *Solve:* Section 2.3/ 2, 4, 8, 10,12; section 2.4/ 2, 4; section 2.5/ 2,10; section 2.6/ 10; section 2.7/ 2, 4, 8, 10

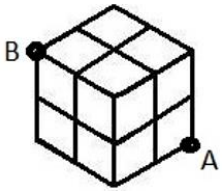
**Homework 4:** Due: Thursday, 18 February

Review section 3.1. Study sections 3.2 – 3.5. The problems in section 3.8 can be solved without reading section 3.8.

- **Prepare for Test I.**

I (Hammack exercises)

Section 3.3/ exercises 4, 8, 10, 12
Section 3.4/ exercises 8, 10, 16
Section 3.5/ exercises 4, 12, 18
Section 3.8/ exercises 4, 8, 10, 16




II Consider a 2 × 2 × 2 cube, as illustrated below. Charlotte, a spider, wants to travel from A to B; she can only walk on the lines. The path must be the shortest (i.e., 2 up, 2 left, and 2 forward). In how many ways can Charlotte travel?

III How many non-negative integer solutions are there to the equation:

III How many non-negative integer solutions are there to the equation:

(a) $x_1 + x_2 + x_3 + x_4 + x_5 = 99$?
(b) The same question as (a), but now assume that the solution must consist of *positive* integers.
(c) Same question as (a) except *at least one of the components* of a solution

($x_1$, $x_2$, $x_3$, $x_4$, $x_5$) must be 0. For example, 97 + 1 + 0 + 0 + 1 = 99 is one such solution.

(b) Same question as (a), but now assume that the solution must consist of *positive* integers.

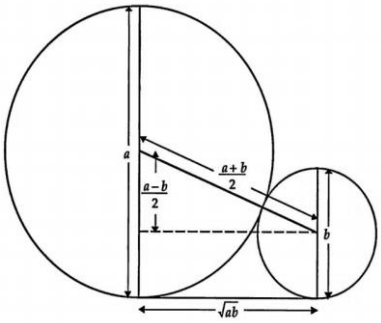
(c) Same question as (a) except *at least one of the components* of a solution ($x_1$, $x_2$, $x_3$, $x_4$, $x_5$) must be 0. For example, 97 + 1 + 0 + 0 + 1 = 99 is one such solution


**Homework 5:** Due: Tuesday, March 10

Review section 3.1. Study sections 3.7 and 3.9. Section 3.8 is optional since we can solve all the problems in section 3.8 from the tools we have mastered so far. In addition, study chapter 9.

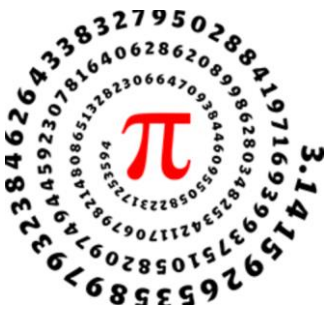
(Hammack exercises)

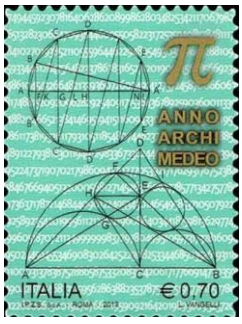
- Section 3.7/ exercises 2, 4, 11 13
- Section 3.9/ exercises 1, 3, 4, 6
- Section 3.8/ exercises 4, 14, 16, 19
- Chapter 9/ exercises 17, 20, 26, 34
- *Proof without words:* Using the clever picture below, give a precise and clear explanation of the **Arithmetic Mean-Geometric Mean Inequality,** *viz.* $\frac{a+b}{2} \geq \sqrt{ab}$ with **equality** iff a = b




- **Prepare for Test II**

**Happy Pi Day!**




**Homework 6:** Due: Thursday, March 19

Study chapters 4, 5, and 6 of Hammack. Solve the following exercises.

126/ exercises 6, 10, 14; 136/ exercises 8, 12, 18, 20, 24; 144/ exercises 2, 4, 6, 10, 18, 24


WHAT'S IGGY DOING HOME FROM SCHOOL THIS TIME OF DAY?
SPRING BREAK
CARTOONSTOCK
Search ID: rde7291