Math 260 Assignments for Fall 2024

for Tuesday, September 3

1. Read the syllabus carefully and browse the web page for this course.

for Wednesday, September 4

1. Read Section 1.1 through Example 1.2, making note of any questions that arise.

for Friday, September 6

1. Read Section 1.1. Although some of the terms here may be new to you, they are not difficult and we will use them quite a bit in the next few weeks. There is no need to memorize all of these terms (especially those in Theorem 1.3) but you certainly need to be familiar with the connectives, truth tables, and the language associated with conditional statements (such as converse and contrapositive).
2. This is the first of many reading assignments. You need to learn how to read mathematics textbooks and (eventually) articles in mathematical journals; this is an important aspect of being prepared for higher mathematics. This type of reading is an acquired skill and takes plenty of patience to learn. You cannot skim, you cannot gloss over details, you may need to pause to think or write out some details, you may need to read a sentence or paragraph multiple times before it is clear, or you may get completely stumped. If you do get stuck at some point, do not just quit reading; put a question in the margin and keep going, trying to make as much sense as you can of what follows. Sometimes your questions will be answered later (either in the text or with a flash of insight). However, if your questions are not resolved, it is important that you ask for help. Also, you need to be certain that you are not fooling yourself into thinking that you actually understand when you really do not.
3. Do exercises 1, 2a, 2d, 3h, 3k (the letters on exercise 3 refer to the parts of Theorem 1.3), 4, and 5 in Section 1.1. We can discuss the reading and exercises in class if necessary.
4. Turn in solutions for exercises 5a and 5c from Section 1.1. (Note that the instructions to consider different universes are relevant for exercise 5a: real numbers versus complex numbers.) Write your solutions very carefully and provide reasons for your answers of true or false. Your solution should include the original statement, along with the converse and the contrapositive, all written clearly. This is your first opportunity to show me the quality of your written work so it would be in your best interest to get off to a good start.

for Monday, September 9

1. Read Section 1.2. Remember to read carefully and to make certain you understand each and every statement. For this section, you should probably pause to reflect at times and create further examples. If you have any questions, write them down and ask them in class, via email, or during office hours.
2. You should work on all of the exercises in this section; each exercise should only take a few minutes.
3. Turn in solutions for exercises 2, 5, and 6d from Section 1.2. For exercises 2 and 5, you should include the verbal statement along with the symbolic statement. This means that you need to copy some version of the exercise before writing the solution. For exercise 6d, you will need a complete sentence or two, along with an algebraic equation, for your explanation. Once again, think about how you are writing and presenting mathematics.

for Tuesday, September 10

1. We will work on quantifiers during class.

for Wednesday, September 11

1. Read Section 1.3 carefully and ponder the implications of quantifiers and their negations. Read the biography of De Morgan; you should be "nerdy" enough (in a good way :)) to determine the year in which he was born. Do you have friends or relatives who can make a similar claim?
2. Be prepared to discuss exercises 1, 2, 3, 4, and 7 in Section 1.3. This means that you should do the exercises and be able to explain your solution to other students in the class.
3. Turn in solutions for exercises 7b, 7c, and 7e from Section 1.3. You do not have to use symbols and quantifiers to negate these definitions but you may use them if you find them helpful. Really work on the wording of the negations to make sure they are clear and be certain that only simple sentences are negated. Since the terms in 7c are probably unfamiliar, you do not need to give any examples, but you should provide examples for the other two definitions. This means to give an example that illustrates the definition and one that illustrates the negation of the definition. In fact, it is a good idea to come up with a variety of examples to help clarify the concept. The purpose of these definitions is not so much that you grasp them fully but that you are exposed to some common terms from higher mathematics and that you can work with them symbolically even if you are unclear as to their meaning.

for Friday, September 13

1. Read Section 1.4. You may need to read very slowly in a few places and think carefully about the implications of the order of the quantifiers.
2. Be prepared to discuss exercises 1, 2, 3, and 4a–e from Section 1.4. Make sure you have clear reasons to support your answers for these exercises.
3. Turn in solutions for exercises 4b and 4e from Section 1.4, wording your negated definitions carefully. Rather than provide examples, use your negated definitions to prove each of the following:
   i) the sequence $\{\sqrt[3]{n}\}$ is not bounded;
   ii) the function $f(x) = \begin{cases} \cos(\pi/x), & \text{if } x \neq 0; \\ 0, & \text{if } x = 0; \end{cases}$ is not continuous at 0.

for Monday, September 16

1. Read Sections 1.5 and 1.6. Since sets appear in almost all areas of mathematics, it is important to acquire a firm understanding of them and their associated notation. The concepts of pairwise disjoint, partition, and power set (defined in Section 1.6) are important.
2. Do exercises 1abcfg, 2, 4ef, 5, and 8 in Section 1.5 and exercises 1, 2, 3, 6, and 10 in Section 1.6. Most of these should be go quickly.
3. Turn in solutions for exercises 1.5.5, 1.6.2, and 1.6.6. Your proof for exercise 1.5.5 should look something like (as in really look like this: format, aligned = signs, reasons, etc.)

$$\begin{aligned}
(A \setminus B) \cup (B \setminus A) &= (A \cap B^c) \cup (B \cap A^c) && \text{(Exercise 3)} \\
&= && \text{(Theorem 1.10 e)} \\
&\quad\vdots && \text{(3 more steps, give reasons)} \\
&= && \text{(De Morgan's Laws)} \\
&= (A \cup B) \setminus (A \cap B) && \text{(Exercise 3)}
\end{aligned}$$

for Tuesday, September 17

1. We will work on sets and set notation during class.

for Wednesday, September 18

1. Read Section 1.7 and work to understand this new concept. This is the first section in which proofs of results play a more prominent role so study them carefully.
2. Do exercises 1, 2, 3, 8, and 9 from Section 1.7. Even if a result seems "obvious", make certain you can write out the details to show how it works.
3. Turn in solutions for exercises 8 and 9a in Section 1.7. For exercise 1.7.8, be extremely thoughtful so that fractions and division do not appear in your solution; there are easy ways to prove the transitive property that do not involve fractions. The reason that no fractions should appear is due to the fact that the universe involves integers. In fact, this equivalence relation is used to **define** the rational numbers..

for Friday, September 20

1. Read the introduction to Chapter 2 and Section 2.1. Since we are beginning proofs in earnest now, read very carefully and make note of any questions or confusions that arise.
2. Be prepared to discuss exercises 1–11 from Section 2.1.
3. Turn in a carefully written two column logic proof (as in the text) for the following:

   Prove $P \Rightarrow Q$; given R, $(P \wedge R) \Rightarrow S$, $\neg Q \Rightarrow \neg T$, $S \Leftrightarrow T$.
4. Turn in solutions for exercises 8 and 12 from Section 2.1. For exercise 8, you can closely imitate the examples in the text; do include the parenthetical remarks this one (and probably only) time. There are several ways to solve exercise 12; feel free to use previous results and/or exercises in this section by referring to them by number. Most likely, you will have to rewrite your proof for this exercise at least once if you want it to read well.

for Monday, September 23

1. Read Section 2.2 carefully. Although $a|b$ is a simple notion and one that is familiar to you, it is very important that you learn how to work with this concept at a deeper level. Note that this concept does not involve fractions or rational numbers or division in the usual sense. Recall that definitions are like formulas; you need to know them inside and out. Just as you can immediately tell someone the derivative of x^2, you should be able to readily quote (essentially verbatim) the definition for $a|b$.
2. Be prepared to discuss exercises 1–8 in Section 2.2. For Exercise 2, use the definition of $n|(2n+3)$ and then some factoring to learn something about n. The proofs requested in exercise 3 should follow easily from the definitions. For exercise 4, consider using part (f) of Theorem 2.7, which is a very powerful result. Finding a has nothing to do with the proof; it is just an interesting aspect of the numbers.
3. Turn in solutions for exercises 4 and 8d in Section 2.2. Since the statement that you are proving in exercise 8d is a biconditional, two proofs are required.

for Tuesday, September 24

1. We will work on proofs of new problems in class.

for Wednesday, September 25

1. Read Section 2.3. This should be an easier section since it is about finding examples rather than writing proofs. However, it is important to note that it can be difficult to find examples in certain situations.
2. Be prepared to discuss all of the exercises from Section 2.3; be sure to read the heading of the exercises.
3. Turn in a solution for exercise 12 in Section 2.3. Be certain to carefully describe how you went about finding a solution. In addition, turn in a solution for exercise 9 in Section 2.2. The statement of this problem and your solution to this problem should be typeset in LaTeX.
4. The first special assignment will be handed out this day; it is due on Wednesday, October 2.

for Friday, September 27

1. Read Section 2.4. The Principle of Mathematical Induction is extremely important and, once you grasp the essential idea and learn how to write PMI proofs well, is a powerful method for proving certain types of results. However, this technique of proof is notorious for causing confusion for many people so do study it carefully.
2. Do exercises 2, 3, 4, 5, 6, 7, and 9 in Section 2.4. Do not use induction for exercise 4. Rather, find a way to use the formula from exercise 2 (think about adding and subtracting the even cubes) to quickly find and establish a formula for the sum given in exercise 4.
3. Turn in a carefully written solution for exercise 6 using the informal style for induction proofs. You might find the simple fact $\frac{1}{(k+1)!} \le \frac{1}{k(k+1)}$ helpful in your proof.
4. Look over the proofs found at the link 'Model Induction Proofs' on the course website. There you will find a proof of a simple result along with three poorly written proofs of the same result, all taken

from common student errors. If you do not spot the errors, please let me know as it is important that you become critical readers of proofs. You should probably try exercise 5 on your own (after studying Theorem 2.13) before reading the solutions online. It is possible to prove most of the results in this section without induction (essentially by appealing to other results that are already known and require induction to prove). If you have time, it is good practice to ponder these other solution methods.

for Monday, September 30

1. Read Section 2.5 very carefully. Be certain that you truly understand the proofs of these two major results. Recall that the purpose of this course is to prepare you for higher mathematics and the ability to read and follow proofs is one of the skills necessary for success in upper level mathematics classes. Do not "fake" yourself into believing you understand a proof when you really don't; ask questions about anything that seems unclear. If one step does not make sense, do not give up on the proof. Just believe the result that you do not understand and see if the rest of the proof makes sense from that point on.
2. Do exercises 1, 2, 4, 9, 10, and 11 in Section 2.5.
3. Turn in solutions for the following two problems:
   i. Prove that for each positive integer $n \geq 2$, the inequality $\dfrac{4^n}{2n} < \dbinom{2n}{n}$ is satisfied.
   ii. Find the maximum value of x^2y subject to the conditions $x > 0$, $y > 0$, and $4x + 3y = 30$. (Do not use calculus.)

for Tuesday, October 1

1. We will review Chapter 1 in preparation for our Friday exam.

for Wednesday, October 2

1. Read Section 2.6. Be certain you understand the distinction between the two forms of induction and try to use the form that is most appropriate for the given situation. The FTA is very important so make sure you know what it says and how to prove it. The boring form of induction is certainly boring but it is important to know how it works and to notice how often it implicitly appears.
2. Work on exercises 1, 3, and 4 in Section 2.6. At this stage of the learning process, you should be focusing on the induction step as the basic idea behind induction proofs should be clear by now. For exercise 3, you might want to write out the cases $n = 8$ to $n = 16$ to see what is going on and why strong induction is needed to prove this result.
3. Turn in a solution for exercise 3 from Section 2.6.
4. Special assignment #1 is also due this day.
5. We will spend our class time discussing the upcoming exam, focusing on Chapter 2.

for Friday, October 4

1. We have a test covering Chapter 1 and Sections 2.1 to 2.6.

for Monday, October 7

1. Work on exercises 5bdef in Section 2.6. My 38 minute YouTube video `https://youtu.be/VagOTqxsRuA` on this topic may be beneficial to view before starting these problems.
2. Turn in a solution for exercise 5d from Section 2.6. Be very careful with the equation found in this exercise. In particular, note that the "long" sum always has an odd number of terms and always ends with a Fibonacci number with an even subscript. Checking the cases $n = 1$, $n = 2$, and $n = 3$ would be a good idea. Note that strong induction is not needed here.

for Tuesday, October 8

1. We will work on some new problems during class.

for Wednesday, October 9

1. Read Section 2.7. The Division Algorithm is rather important so read the proof carefully and fill in the missing details; this includes solving exercise 3 at the end of the section.
2. Work on exercises 2, 4, 6, and 8 in Section 2.7. You have an example to imitate for exercise 2. Do exercise 4 without a calculator. Exercise 6 may seem trivial but do write out the proof carefully. For the uniqueness part, start with "Suppose that y and z both satisfy the equation" then prove that $y = z$. Exercise 8 comes with directions as well; please follow them, using the MVT as in Example 2.31.
3. Turn in solutions for exercises 6 and 8 in Section 2.7.

for Friday, October 11

1. No class today due to the October Break.

for Monday, October 14

1. Read Section 2.8. Indirect proof is a good way to go in some cases, but try not to overdo it.
2. Work on exercises 1 through 11 in Section 2.8. For some of the exercises that request examples, you might want to go to `https://www.wolframalpha.com/` and type a command such as "factor the integer $2 * 17 * 23 + 1$ into primes". We will discuss these exercises in class, hopefully having students giving their examples and outlining their proofs.

for Tuesday, October 15

1. We will review Chapter 2 and work on writing proofs to new problems. We can also clarify the new ideas in Chapter 3.

for Wednesday, October 16

1. Read Section 3.1. Congruence is an elementary concept once you become familiar with it, but you do need to think carefully about its meaning and properties.
2. Work on all of the exercises in Section 3.1; most of these should go rather quickly, but there are a few that take a bit more time. For exercises 4, 5, and 6, be certain to use congruence properties even though there are other ways to proceed.
3. Turn in solutions for exercises 2 (a proof of part (7) only), 8f, and 9. Write your solutions carefully even for exercises that involve computations. Your solution to exercise 2 should not be very involved; if it is, look for a better way. For exercise 9, note that x must have the form $17k + 4$ to solve the first congruence. Now substitute this into the second congruence and determine k.
4. The second special assignment (distributed in class) is due a week from today, October 23.

for Friday, October 18

1. Read Section 3.2. Since we are beginning a study of an abstract space, you really need to work hard to understand what is going on.
2. Be prepared to discuss exercises 1–7 in Section 3.2.
3. Turn in solutions for Exercise 3e (that is, give a proof of part (e) of the theorem), Exercise 10a (use the notion of congruence for your proof), and a modified version of Exercise 6 (consider the space $\mathbb{Z}_{65}$ rather than the space $\mathbb{Z}_{14}$) from Section 3.2. You need to be extremely careful for the proof requested in Exercise 3e. Pretend that you are trying to defuse a bomb and a wrong move will blow up the classroom. Make certain that every single step has a reason, one that you can verify from the text, not just because "it has to be true." You should start with the left-hand side of the equality and perform five (5) steps, each one with a clear reason, the last one being the right-hand side of the equality. You can line up the equations and provide the reason for each step off to the side.

for Monday, October 21

1. Read Section 3.3 carefully. Computationally, the Euclidean algorithm is quite elementary. However, the results given in Theorems 3.11 and 3.13 are extremely (as in EXTREMELY) important. Keep track of any questions that arise during the reading, especially any that occur while reading the second proof of Theorem 3.11.
2. Do exercises 1, 7, 10, 11, and 14 in Section 3.3, thinking very carefully about the proofs that are needed. Try doing the computations for exercise 1 as efficiently as possible, preferably without technology.
3. Turn in solutions for exercises 11 and 14 in Section 3.3.

for Tuesday, October 22

1. We will do our best to clarify the new concepts from Chapter 3.
2. Students will present solutions at the board for the problem listed by their name: Xylia (8e in Section 3.1), Aden (1d in Section 3.3), Sebastian (7 in Section 3.3), and Jin (solve $7x + 11 \equiv 40 \pmod{61}$). Be certain to show your work carefully and clearly.

for Wednesday, October 23

1. Read Section 3.4 carefully.
2. Work on exercises 5–12 in Section 3.4.
3. Turn in a solution for exercise 10 in Section 3.4.
4. The second special assignment is due on this day.
5. The third special assignment (distributed in class) is due a week from today, October 30.

for Friday, October 25

1. Read Section 3.5, paying careful attention to the details in the proof of Theorem 3.29.
2. Work on exercises 1–9 in Section 3.5.
3. Turn in solutions for exercises 6 (just the first equality involving the gcd) and 8. For Exercise 6, use Theorem 3.26. For Exercise 8, you should use exercises 3.5.6, 3.3.11, and 3.4.10 in your proof.

for Monday, October 28

1. Read Section 3.6. Think carefully about the examples presented at the beginning of the section to better appreciate the need for a proof of the FTA, then be certain that you understand the proof of the FTA and the results that lie behind it. Read Theorems 3.32 through 3.34 carefully so that the notation does not disguise the simple ideas that these results express.
2. Work on exercises 1, 2, 6, 7, 9, 10, 11, 16, and 17 in Section 3.6.
3. Turn in solutions for part (b) of Exercise 1 (your example must NOT involve a perfect square) and Exercise 17 (giving a direct proof of the contrapositive; perhaps the result in Exercise 9 will help).

for Tuesday, October 29

1. We will continue to clarify the new concepts from Chapter 3.
2. Students will present solutions at the board for the problem listed by their name: Xylia (8 in Section 3.6), Aden (16 in Section 3.6), Sebastian (9 in Section 3.5), and Jin (14 in Section 3.4). Be certain to present your work carefully and clearly.

for Wednesday, October 30

1. The third special assignment is due on this day.
2. We will review for the test on Friday. Look over the material and exercises we have discussed since the first exam. You need to be familiar with (and be able to use) the definitions and proof techniques we have discussed thus far, you need to understand the concepts that have been introduced, and you need to be able to solve problems similar to those assigned in the exercises, including induction problems. In addition, you need to know (as in present them if requested) the proofs of the following theorems (listed on the next page):

a. Theorem 2.8 (f) (divisibility and linear combinations)

b. Theorem 2.23 (the existence part of the Fundamental Theorem of Arithmetic)

c. Theorem 2.34 (there are an infinite number of primes)

d. Theorem 3.2 (congruence and equal remainders)

e. Theorem 3.3 (basic properties of congruence using the definition)

This is not intended to be an exercise in memorization. You should know the basic idea behind each proof and then be able to write your own version of it without needing too much time for thought.

for Friday, November 1

1. Our second exam is on this day. You need to be familiar with all of the topics discussed thus far, but the emphasis will be on topics from Sections 2.7 and 2.8 and the first six sections of Chapter 3. Refer also to the items listed on the Wednesday assignment above.

for Monday, November 4

1. Look over the proof that the series composed of the reciprocals of all of the primes diverges. Be certain that you understand every step; if not, please ask a question in class.

for Tuesday, November 5

1. We will continue discussing the ideas in Section 3.7 presented on Monday.
2. Students will present solutions at the board for the Section 3.7 problem listed by their name: Xylia (3be), Aden (4, find at least four values for n), Sebastian (10), and Jin (5). Be certain to present your work carefully and clearly.

for Wednesday, November 6

1. Read Section 3.7. Expect to spend at least an hour reading through the details of the proofs and results in this section. Keep track of any questions that you have.
2. Work on exercises 3, 6, 7, 8, 9, 12, and 13 in Section 3.7. You will notice that many of these are computational in nature and provide practice with the ideas used or developed in this section. Try to be as efficient as possible in your computations, taking advantage of modular arithmetic and results in this section.
3. Turn in a solution for exercise 6 in Section 3.7. Note that you simply need to give an example and prove that it works. However, you must provide an example for each integer $e > 2$; you cannot simply give an example for $e = 3$ or $e = 4$ and be done. You want a formula (in terms of e) that gives an example for each such e.

for Friday, November 8

1. Carefully read and study Section 3.8 through the statement of Theorem 3.48. Remember that there is a distinction between understanding a theorem and being able to apply it versus understanding its proof. But do read the proofs carefully and record any questions that arise.
2. Work on exercises 1 through 7, doing your computational work without the aid of a calculator.
3. Turn in solutions for exercise 4 and the extra exercise 6 problem of determining $\left(\frac{13}{41}\right)$: do this problem two ways, one using Euler's criterion and the other using the Quadratic Reciprocity Theorem.
4. The fourth special assignment (distributed in class) is due a week from today, November 15.

for Monday, November 11

1. Read the rest of Section 3.8, doing your best to understand the proof of Theorem 3.48.
2. Work on exercises 8, 9, 10 and 11 in Section 3.8.
3. Turn in solutions for exercises 8 (it is not as scary as it may first appear) and 10 (showing your computations clearly).

for Tuesday, November 12

1. We will do our best to clarify the ideas and proofs in Sections 3.7 and 3.8.
2. Students will present solutions at the board for the problem listed by their name: Xylia (16a in Section 3.7), Aden (17 in Section 3.7), Sebastian (9f in Section 3.8), and Jin (10 in Section 3.8). Be certain to present your work carefully and clearly.

for Wednesday, November 13

1. Spend about an hour carefully reading Section 3.9. If you take your time, you should find that the proof of Theorem 3.50 is really not that difficult to follow. Note the use of the Well-Ordering Property in the second part of the proof.
2. Work on exercises 1 through 6 in Section 3.9.
3. Turn in a solution for exercise 5 in Section 3.9.

for Friday, November 15

1. The fourth special assignment is due on this day.
2. Read Section 4.1. These ideas may seem simple (and they are probably quite familiar) but do give them careful thought, especially when the sets A and B are not sets of numbers.
3. Be prepared to discuss exercises 1–6 in Section 4.1; I will not be collecting any solutions to exercises from this section.

for Monday, November 18

1. Read Section 4.2.
2. Work on all of the exercises in Section 4.2.
3. Turn in a solution for exercise 7 in Section 4.2. Although it may seem a bit verbose, give a careful proof (a "chasing points" proof) that each set is a subset of the other.

for Tuesday, November 19

1. Students will present solutions at the board for the Section 4.2 problem listed by their name: Xylia (1), Aden (4), Sebastian (8), and Jin (5). Be certain to present your work carefully and clearly.

for Wednesday, November 20

1. Read Section 4.3 and think carefully about these new terms.
2. Be prepared to discuss the exercises in Section 4.3. Many of these exercises request examples or ask simple questions so be prepared to present your ideas to the class. For exercise 10, give a direct proof that uses the standard definition of surjective functions; avoid using induced set functions. This should be a "follow your nose" type proof but do write the details clearly, probably in five short sentences.
3. Turn in solutions for exercises 8 (note that all of the inputs are positive integers) and 10 (see the above comment in item (2)) from Section 4.3.

for Friday, November 22

1. Read Section 4.4 (a very short section).
2. Be prepared to discuss exercises 1–5 in Section 4.4.
3. Turn in a solution for exercise 5 from Section 4.4. We discussed the general idea behind this problem in class. Your table should look a bit like the multiplication table for $\mathbb{U}_9$ on page 77, resulting in a matrix of letters. The product $a * b$ means the left side column entry a times the upper row entry b.

Thanksgiving break

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for Monday, December 2

1. Read Section 4.6. (We are omitting Section 4.5.)
2. Be prepared to discuss exercises 1, 2, 3, 9, and 10 from Section 4.6.
3. Turn in a solution for exercise 10 in Section 4.6.

for Tuesday, December 3

1. To be determined based on how things are going.

for Wednesday, December 4

1. Read Section 4.7 carefully and think deeply about the ideas that are discussed. This is a longer section and it contains some rather strange ideas concerning different sizes of infinity. If necessary, you can skim the proofs of Theorems 4.32 and 4.33.
2. Work on exercises 1, 2, 3, 7, and 8 in Section 4.7. Students will present solutions at the board for the Section 4.7 problem listed by their name: Xylia (1ab), Aden (1cd), Sebastian (1gh), and Jin (1ef). Be certain to present your work carefully and clearly.
3. Turn in a solution for exercise 2 in Section 4.7, giving careful proofs of injectivity and surjectivity; you should use the FTA in your proof.
4. We will review for the Friday exam.

for Friday, December 6

1. We have our third exam this day: details to come.

for Monday, December 9

1. Go to the website `http://www.ams.org/mathscinet/msc/msc2010.html` and spend some time navigating around the subject classification. By clicking on the "Browse Classification" box, you can see the various subject headings and then continue going into more depth by clicking on a given two digit number. Spend some time reading all of the headings and then go into more depth for several of those that intrigue you. The purpose for having you spend some time looking over these areas is to give you a sense of the scope of mathematics.

   Next, go to the Penrose Library link from the Whitman page and click on the tab for Database A–Z, then click M, and finally click on MathSciNet. (You may need to login for this part.) Click on Authors and try typing in the name of a person in the mathematics faculty to see what we have published of late. For example, you can type 'Gordon, Russell*' in the author box and see what comes up. You can also look for various topics. You can type 'Binomial Theorem' in the review text box to see a list of papers that make use of this term. This is a good resource when you are looking for reviews of papers published in the last 80 years or so.

   Finally, go to the site `https://en.wikipedia.org/wiki/List_of_mathematics_journals` and scroll down the list of journals, just skimming the titles. If you become intrigued by a title, click on the link and check out the table of contents of a recent issue of the journal.
2. When you are finished with item (1) (I am assuming that you spend at least 30–45 minutes doing this but you do not need to do much more unless you become curious), write two or more paragraphs (take the writing seriously) on the links you browsed and your impressions (personal or otherwise) concerning mathematics after surfing these sites and developing a sense for the scope of the field of mathematics. It is preferred that you typeset your paragraphs using LaTeX.