

Exploration Assignments

I will continue to update this document with additional exploration assignment possibilities as the semester progresses. Reminders from the syllabus:

You may complete up to four exploration assignments (think “bonus homework assignments” or “make-up participation points”) over the course of the semester. Two must be completed by midway through the semester (Feb. 26), and two must be completed during the second half of the semester (due the last day of class). I will not accept more than two after Feb. 26, so if you would like to receive the maximum amount of extra credit available, you must complete two by mid semester. (FYI: Last time I taught the course, almost *everyone* wished they had turned in exploration assignments before the first deadline.) **Some of these may disappear after Feb. 26, so if there is one you really like, do it early!**

Important note: Usually, the punishment for violating the academic integrity policy, if it is your first offense, is a 0 on the relevant assignment. However, I find the idea of cheating on extra credit assignments so offensive that **any student caught cheating on exploration assignments will have their course grade reduced by a full letter grade**, in addition to being referred to the Department of Student Conduct and Academic Integrity.

Another important note: I’m happy to help you with these assignments! If you submit your assignment *at least one week before the deadline*, I can give you feedback and allow you to resubmit it. If you come to office hours, I will talk to you about the exploration assignments. Even though these are “extra credit”, I’m happy to help you use them as a learning opportunity!

Options:

- *Section 2.5 - up to 2 points.* Read section 2.5. For one point, complete exercises 2.42, 2.44, and 2.46. For an additional point, complete exercise 2.48 (a formal proof).
- *2 points.* Complete challenge problems A through C from HW 1. Note that if you already completed them mostly correctly, then you should choose something else!
- *Suggested by a classmate - 1 point.* We proved that if \overline{G} is disconnected, then G has diameter at most 2. Is the converse true? If yes, prove it. If not, give an infinite collection of counterexamples. (For example, you could say something like C_n , because that is infinitely many graphs, but you couldn’t just say C_9 , because that’s only one graph. Of course, C_n does NOT have diameter 2 when $n > 5$, so C_n isn’t an infinite collection of counterexamples - I was just telling you what I meant by an infinite collection of counterexamples.)
- *Induction practice - 1 point.* Show that n lines separate the plane into $(n^2 + n + 2)/2$ regions if no two lines are parallel and no three intersect at a single point.
- *Attend a research talk on graph theory - 1 point each.* If any come up on our campus (aside from the visiting interviewing candidates), I will let you know. In order to receive the point, you must attend the seminar and write something about what you learned. If you do additional research after the seminar to enhance your write-up (be sure to cite your sources), I may give you an additional point.
- *Connect graph theory to your life - 1 point.* Write a 1-page summary of where you have encountered graph theory in a meaningful way in either another course or in some other aspect of your life. If you do research that includes some significant mathematical content to enhance your write-up, then I may give you an additional point.

- *Connect graph theory to programming - 2 to 3 points.* Write a computer program to calculate something we have talked about in class - the diameter of an input graph, the Havel-Hakimi Theorem to test a sequence to see if it is graphic, etc.)
- *Other - ??? points.* If you have a suggestion for an additional activity you might complete that would enhance your learning in graph theory, feel free to discuss with me the possibility of earning extra credit for it.