FORMAT 1

Submit original with signatures + 1 copy + electronic copy to Faculty Senate (Box 7500).
See _http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/_ for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:

Department	Mathematics & Statistics	College/School	CNSM

Prepared by	Leah Berman	Phone	907-474-7123

Email Contact	lwberman@alaska.edu	Faculty Contact	Leah Berman

1. ACTION DESIRED (CHECK ONE): Trial Course [ ]   New Course [X]

2. COURSE IDENTIFICATION: Dept **MATH**   Course # **6XX**   No. of Credits **3**

Justify upper/lower division status & number of credits:	Graduate course; meets 3 hours a week

3. PROPOSED COURSE TITLE: Topics in Geometry

4. To be CROSS LISTED? YES/NO   **NO**   If yes, Dept: Course #

NOTE: Cross-listing requires approval of both departments and deans involved. Add lines at end of form for additional required signatures.

5. To be STACKED? YES/NO   **NO**   If yes, Dept.   Course #

How will the two course levels differ from each other? How will each be taught at the appropriate level?:	

Stacked course applications are reviewed by the (Undergraduate) Curricular Review Committee and by the Graduate Academic and Advising Committee. Creating two different syllabi—undergraduate and graduate versions—will help emphasize the different qualities of what are supposed to be two different courses. The committees will determine: 1) whether the two versions are sufficiently different (i.e. is there undergraduate and graduate level content being offered); 2) are undergraduates being overtaxed?; 3) are graduate students being undertaxed? In this context, the committees are looking out for the interests of the students taking the course. Typically, if either committee has qualms, they both do. More info online – see URL at top of this page.

6. FREQUENCY OF OFFERING: Fall even years

7. SEMESTER & YEAR OF FIRST OFFERING
(AY2013-14 if approved by 3/1/2013; otherwise
AY2014-15)

Fall 2014

8. COURSE FORMAT:
NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, **any core course compressed to less than six weeks must be approved by the Core Review Committee.**

COURSE FORMAT:
(check all that apply)

	1		2		3		4		5	X	6 weeks to full semester

OTHER FORMAT (specify)

Mode of delivery (specify lecture, field trips, labs, etc)   **lecture**

9. CONTACT HOURS PER WEEK:

3	LECTURE hours/weeks		LAB hours /week		PRACTICUM hours /week

Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/guidelines-for-computing-/ for more information on number of credits.

OTHER HOURS (specify type)

10. <u>*COMPLETE*</u> *CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking (50 words or less if possible):*

Example of a <u>complete</u> description:

FISH F487 W, O   Fisheries Management
3 Credits   Offered Spring
Theory and practice of fisheries management, with an emphasis on strategies utilized for the management of freshwater and marine fisheries. *Prerequisites: COMM F131X or COMM F141X; ENGL F111X; ENGL F211X or ENGL F213X; ENGL F414; FISH F425; or permission of instructor.* Cross-listed with NRM F487. (3+0)

MATH 6XX Topics in Geometry
3 credits, Offered Fall even numbered years
Elective topics in geometry. Recent offerings have included configurations of points and lines; topology and differential geometry of surfaces; polyhedra and polytopes. Prerequisites: graduate standing or permission of instructor. Recommended: Linear algebra, geometry, undergraduate real analysis, undergraduate abstract algebra.

11. COURSE CLASSIFICATIONS: Undergraduate courses only. Consult with CLA Curriculum Council to apply S or H classification appropriately; otherwise leave fields blank.

H = Humanities

S = Social Sciences

Will this course be used to fulfill a requirement for the baccalaureate core? **If YES, attach form.**   YES: NO: **X**

IF YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, **Format 6**

W = Writing Intensive, **Format 7**

X = Baccalaureate Core

11.A Is course content related to northern, arctic or circumpolar studies? If yes, a   "snowflake" symbol will be added in the printed Catalog, and flagged in Banner.

YES

NO   **X**

12. COURSE REPEATABILITY:
Is this course repeatable for credit?

YES   **X**   NO

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).

The topics covered in the course will change with each offering.

How many times may the course be repeated for credit?	1	**TIMES**

If the course can be repeated for credit, what is the maximum number of credit hours that may be earned for this course?	6	**CREDITS**

If the course can be repeated with <u>variable</u> credit, what is the maximum number of credit hours that may be earned for this course?		**CREDITS**

13. GRADING SYSTEM: Specify only one. Note: Changing the grading system for a course later on constitutes a Major Course Change – Format 2 form.

LETTER: [X]

PASS/FAIL: [   ]

RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES	*graduate standing or permission of instructor*

These will be *required* before the student is allowed to enroll in the course.

15. SPECIAL RESTRICTIONS, CONDITIONS	

16. PROPOSED COURSE FEES	$

Has a memo been submitted through your dean to the Provost for fee approval?
Yes/No [   ]

17. PREVIOUS HISTORY

Has the course been offered as special topics or trial course previously?
Yes/No   [Y]

If yes, give semester, year, course #, etc.:	Fall 2010 (as Math 665: Configurations, and as MATH 665: Theory of Surfaces), Fall 2012 (as Math 665: Polytopes)

18. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

We plan on teaching this course as part of our regular rotation of graduate electives.

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No				Current library offerings are adequate.
	X	Yes		

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20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

This will enhance the elective choices for our graduate students and will regularize current practice.

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21. POSITIVE AND NEGATIVE IMPACTS

*Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.*
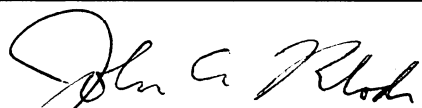
Negative impacts include reducing the number of full-time faculty members available to teach lower-level courses during the semester this course is offered. However, in practice, offerings of the Topics in Geometry course simply replace previous offerings of the Graduate "topics" course, and will not transfer net faculty load towards graduate courses. Postitve impacts include strengthening our graduate mathematics program.

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

Having a graduate geometry course will allow graduate students to expect electives regularly on various topics in geometry (e.g., discrete geometry, differential geometry) which will allow faculty to teach courses in their area of specialization. We have several faculty whose research areas are in discrete geometry, differential geometry, or are related to discrete geometry (e.g., graph theory). This course will help fill out our revised graduate course matrix, allowing us to offer at least three graduate courses per semester (roughly one each in core graduate courses, pure mathematics, and applied mathematics topics; the topics in geometry would be a pure offering.)
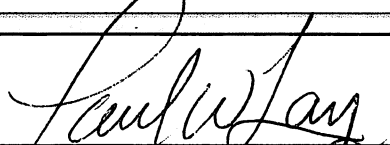
APPROVALS: *Add additional signature lines as needed.*

John G. Rhode Date 9/27/2013

Signature, Chair, Program/Department of: | DMS

Thomas K. Green Date 10-16-13

Signature, Chair, College/School Curriculum Council for: | CNSM

Paul W. Lay Date 10/16/13

·Signature, Dean, College/School of: | CNSM

Offerings above the level of approved programs must be approved in advance by the Provost.

Date

Signature of Provost (if above level of approved programs)

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

Date

Signature, Chair
Faculty Senate Review Committee: ___Curriculum Review   ___GAAC

___Core Review   ___SADAC

ADDITIONAL SIGNATURES: *(As needed for cross-listing and/or stacking)*

Date

Signature, Chair, Program/Department of:	

	Date	

Signature, Chair, College/School Curriculum Council for:	

	Date	

Signature, Dean, College/School of:	

ATTACH COMPLETE SYLLABUS (as part of this application). This list is online at:
http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/uaf-syllabus-requirements/
The Faculty Senate curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course (or changes to it) may be <u>denied</u>.

Syllabus CHECKLIST for all UAF courses
During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

1. Course information:
 θTitle, θ number, θcredits, θprerequisites, θ location, θ meeting time
(make sure that contact hours are in line with credits).

2. Instructor (and if applicable, Teaching Assistant) information:
 θ Name, θ office location, θ office hours, θ telephone, θ email address.

3. Course readings/materials:
 θ Course textbook title, θ author, θ edition/publisher.
 θ Supplementary readings (indicate whether θ required or θ recommended) and
 θ any supplies required.

4. Course description:
 θ Content of the course and how it fits into the broader curriculum;
 θ Expected proficiencies required to undertake the course, if applicable.
 θ Inclusion of catalog description is *strongly* recommended, and
 θ Description in syllabus must be consistent with catalog course description.

5. θ Course Goals (general), and (see #6)

6. θ Student Learning Outcomes (more specific)

7. Instructional methods:
 θ Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

8. Course calendar:

θ A schedule of class topics and assignments must be included. <u>Be specific</u> so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

9. Course policies:

θ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

10. Evaluation:

θ Specify how students will be evaluated, θ what factors will be included, θ their relative value, and θ how they will be tabulated into grades (on a curve, absolute scores, etc.) θ Publicize UAF regulations with regard to the grades of "C" and below <u>as applicable</u> to this course. (Not required in the syllabus, but is a convenient way to publicize this.) Link to PDF summary of grading policy for "C":

<u>http://www.uaf.edu/files/uafgov/Info-to-Publicize-C_Grading-Policy-UPDATED-May-2013.pdf</u>

11. Support Services:

θ Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

12. Disabilities Services: Note that the phone# and location have been **updated.** <u>http://www.uaf.edu/ disability/</u> The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials.

θ State that you will work with the Office of Disabilities Services (208 WHITAKER BLDG, 474-5655)to provide reasonable accommodation to students with disabilities.

5/21/2013

Instructor: Dr. Leah Berman

Office: Chapman 303A

Office Phone: 907-474-7123

Cell Phone: 907-347-4021 (don't call after 9 PM)

e-mail: lwberman@alaska.edu (best way to contact me!)

AIM screen name: leahwrenn

Classroom and class meeting times: Reichardt 165, MWF, 10:30 – 11:30 AM.

Office hours: MWF 2–3 PM, Th 10 – 11AM, and by appointment. To make an appointment, just drop me an e-mail. You are also welcome to stop by my office at any time and see if I am free (even without a scheduled appointment); however, there is a possibility that I may be busy/away if you haven't set up an appointment. These office hours are subject to change.

Prerequisites: Graduate standing or permission of instructor. **Recommended:** Linear algebra, undergraduate abstract algebra, geometry.

Course description, goals, student learning outcomes: A (p_q, n_k) combinatorial configuration is a collection of p objects, called "points" and n collections of points, called "lines", so that each point is contained in q lines, and each line contains k points. If the combinatorial configuration may be constructed so that the "points" are really points in some Euclidean space, typically $\mathbb{E}^2$, and the "lines" are straight lines (or pseudolines) in that space, then the resulting object is a geometric configuration. We will study some of the history of configurations and then focus on recent, active areas of study, especially of geometric (n_k) configurations.

Required Text: Branko Grünbaum. *Configurations of Points and Lines* AMS, 2009.

Required Software:

- *The Geometer's Sketchpad.* Available from Key Curriculum Press, www.keypress.com

- *LaTeX.* If you use a Macintosh, TeXShop is a great editor, and it's free. For Windows, TeXnicCenter is at least free. Talk to me if you need help.

Recommended Software: Some computer algebra system. *Mathematica* is the software I use. Available from www.wolfram.com, and there's student pricing available.

Instructional methods:

Lecture: Class meets three times a week; these will be primarily active lectures, supplemented with the occasional in-class worksheet. You are expected to participate in the lecture by asking questions! I will call on people at random during class.

Homework and labs: Written homework will be assigned on a weekly basis; it will be listed on Blackboard, and you will be responsible for checking on a regular basis. Due dates will be as assigned.

You are **very strongly encouraged** to collaborate with your classmates. However, you are expected to write up solutions to homework problems yourself.

Exams: There will be two take-home exams. These are tentatively scheduled for Friday October 8 and Friday November 12. There will be a final project, due by NOON on Wednesday, December 15.

Tentative schedule: (probably subject to change almost immediately)

Weeks	Chapter in the text
1–2	1
3–4	2
5–9	3
10–13	4–5

Course Policies:

e-mail: *You are responsible for checking your* `alaska.edu` *e-mail account every day before class.* This is the e-mail address I have access to, and this is what I will use to get in touch with you. If you don't typically check it, then set it up to forward to your main account.

Absences and make-ups: You are expected to attend every class. Missing classes will have an adverse effect on your course grade. *If you miss more than six classes, or if you do not show up to take an exam, I may withdraw you from the course.*

If you must miss class, you are responsible for notifying me ahead of time to make appropriate arrangements. Except in unusual circumstances, make-up quizzes and exams will not be given.

Illness: Please do not come to class if you are possibly contagious. If you are too sick to come to class, please e-mail me **BEFORE CLASS**.

Announcements: From time to time, announcements and comments will be sent out via e-mail. **It is your responsibility to check your e-mail account to receive this information.**

Evaluation:

Homework	35%
Exam 1	20%
Exam 2	20%
Final project	25%

To get a rough sense of how numerical grades correspond to letter grades:

% cutoff	letter grade	% cutoff	letter grade	% cutoff	letter grade	% cutoff	letter grade
60	D-	70	C-	80	B-	90	A-
63	D	73	C	83	B	93	A
67	D+	77	C+	87	B+	97	A+

Support Services: You are strongly encouraged to attend office hours if you have questions, or e-mail/instant message me. I also encourage you to work with other students where appropriate.

Disabilities Services: The Office of Disability Services implements the Amreicans with Disabilities Act (ADA) and insures that UAF students have equal access to the campus and course materials. I will work with the Office of Disability Services (203 WHIT, 474-7043) to provide reasonable accomodation to students with disabilities. Please come talk to me as soon as possible if you have/need accomodations.

Course Description

An area of beautiful 19th and 20th century mathematics concerns the interplay of analysis and topology on manifolds. A rigorous study of these topics requires many years of graduate study. In this course, we look at these ideas in the context of two-dimensional manifolds (i.e. surfaces). Many of these ideas are most clearly seen in this context and can be presented without a lot of machinery. We'll study the classification of compact surfaces, elementary aspects of algebraic topology (Betti numbers of surfaces, the Brower fixed point theorem, the Jordan curve theorem), a little Morse theory, Riemanninan metrics and the Gauss-Bonnet theorem, and the Poincaré-Hopf index theorem.

Essential Information

Professor	David Maxwell
Office	Chapman 308C
Email	damaxwell@alaska.edu
Phone	474-1196
Web	http://www.math.uaf.edu/~maxwell
Required Text	**Lectures on Surfaces: (almost) everything you wanted to know about them**, *A. B. Katok and V. Climenhaga*, AMS Press

Prerequisites:

Graduate standing **or** permission of instructor.

Class Time

There will be three hours of class lecture each week:

Lecture Times	
MWF	1:00–2:00

Office Hours

I will schedule 3 hours a week of formal office hours after consultation with my students.

My office hours will always be posted on my web site and on my office door. I have an open door policy; if I'm in my office and my door is open, please feel free to drop by with questions. You are also welcome to schedule a meeting outside of my formal office hours by sending me an email.

Homework

There will be a homework assignment due roughly every week, on a day we will pick together. Each week's assignment and due date will be announced in class and will be posted on my web page. I expect we will work through a majority of the exercises from the course text.

Regarding late homework, I will accept from each student a single late homework with no questions asked. Simply hand in a note in lieu of your homework on the week you wish to take advantage of the late homework policy. You will then hand in the homework no later than one week after it was due. Subsequent late homeworks will be accepted only under extenuating circumstances to be determined at my discretion.

Homework Solutions

In an exercise in collaborative mathematics, the class will create solutions for each week's homework. The hope here is that the process of creating the solutions will make the solutions themselves more valuable. Here are the ground rules:

1. Students can expect to contribute a solution at a rate of about one a week. I will occasionally write solutions to harder problems.

2. Solutions must be written in LaTeX. Diagrams can be handwritten and scanned or electronically generated.

3. I will assign problems to students in a pseudo-random fashion. That is, I'll try to assign them randomly, but I'll also keep an eye out to ensure that you don't get a hard problem twice in a row.

4. Submit your solutions (by email) to me by the evening before the assignment's due date. I'll review your work and ask for changes if need be.

5. At least once during the semester, your solution must include a (non-handwritten) diagram. The diagram must include both a picture of some kind, as well as mathematical text.

6. Participation in this exercise is included in your homework grade (and is equivalent to another homework assignment).

I reserve the right to adjust these guidelines if I find this exercise can be improved.

Project

Each student will complete a project for the class delving into an aspect of surfaces (or a related area of geometry or topology) either that we have not studied, or to a greater depth than we have studied. The goal of the project is for you to allow you to explore an area of mathematics and report back on it to the class. Your project will consist of a 30 minute oral presentation and a short paper. We'll schedule the presentations for the last week of class. More details on the written component will be made available later in the class.

Midterm

There will be one take-home midterm exam. It is tentatively scheduled to be posted on Friday, October 22 and will be due one week later.

Final Exam

There will be a take-home final exam and an in-class exam. The in class exam will be held on Wednesday, December 15, 1:00-3:00. The take-home exam will be handed out about one week prior to the in-class exam and will be due at the start of the in-class exam. The take-home exam will emphasize problem solving whereas the in-class exam will emphasize familiarity with definitions, theorems, and basic results.

Evaluation

Course grades will be determined as follows:

Homework	40%
Project	10%
Midterm	25%
Final	25%

Letter grades will be assigned according to the following scale. This scale is a guarantee; I also reserve the right to lower the thresholds.

A+	97–100%	C+	77–79%	F	≤ 59
A	93–96%	C	73–76%		
A-	90–92%	C-	70–72%		
B+	87–89%	D+	67–69%		
B	80–86%	D	63–66%		
B-	not given%	D-	60–62%		

Tentative Schedule

The following is a tentative list of the topics to be covered in this class. As we proceed in the course, the course web page will list specific sections to be read for each week.

Week	Topics and Events
9/3	Course overview.
9/6 – 9/10	Chapter 1: Examples and properties of surfaces. Monday: Labor Day
9/13 – 9/17	Chapter 1: Geodesics and isometries.
9/20 – 9/24	Chapter 2: Simplicial complexes, triangulation, Euler characteristic.
9/27 – 10/1	Chapter 2: Orientability, classification of compact sufarces.
10/4 – 10/8	Chapter 2: Classification of compact sufarces (continued!).
10/11 – 10/15	Chapter 2: Introduction to homology, Betti numbers.
10/18 – 10/22	Chapter 2,3: Homology continued. Smooth structures. Friday: Take-home midterm posted
10/25 – 10/29	Chapter 3: Smooth surfaces, quotients, diffeomorphisms. Friday: Last day to withdraw with a 'W'
11/1 – 11/5	Chpater 3: Riemann surfaces and conformal maps.
11/8 – 11/12	Chapter 4: Metrics on surfaces, lengths, angles, geodesics.
11/15 – 11/19	Chapter 4: Hyperbolic geometry, classification of isometries.
11/22 – 11/26	Chapter 4: Curvature, area, and the Gauss-Bonnet Theorem. Thursday: Thanksgiving
11/29 – 12/3	Chapter 5: Introduction to degree-theory.
12/6 – 12/10	Catch-up and presentations Friday: Take-home final posted
12/13	Exam Week Monday: Last day of class

Rules and Policies

Collaboration
You are encouraged to work together in solving homework problems. But each student must write up his or her own solutions independently. If you receive significant help solving a problem, it is customary to make a note in your homework to give the person who helped you credit.

Makeup Exams
You can make up an exam if certain extenuating circumstances prevent you from taking it and if you inform me in advance. Contact me as soon as possible if you are going to miss an exam.

Attendance
Attendance is not included directly as part of your grade.

Cell Phones
Turn off your cell phone before you come to class.

Disabilities Services
I will work with the Office of Disabilities Services (203 Whitaker, 474-7043) to provide reasonable accommodation to students with disabilities.

Incomplete Grade
Incomplete (I) will only be given in Computer Science, Mathematics or Statistics courses in cases where the student has completed the majority (normally all but the last three weeks) of a course with a grade of C or better, but for personal reasons beyond his/her control has been unable to complete the course during the regular term. Negligence or indifference are not acceptable reasons for the granting of an incomplete grade. (Note: this is essentially the old University policy.)

Late Withdrawals
A withdrawal after the university deadline from a Department of Mathematical Sciences course will normally be granted only in cases where the student is performing satisfactorily (i.e., C or better) in a course, but has exceptional reasons, beyond his/her control, for being unable to complete the course. These exceptional reasons should be detailed in writing to the instructor, department head and dean.

Academic Dishonesty
Academic dishonesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.

Instructions:

- Please include the question statement in your writeup. Your homework should be prepared using LaTeX. Your solutions should be written using grammatically correct, complete sentences.

- Diagrams may be prepared using your software of choice. I suggest using *The Geometer's Sketchpad* for diagram preparation; you can copy your diagram and then paste into a program which can convert to PDF, which you can then include in your file. If you're really hard up, you may leave space in your file and draw by hand, but such diagrams must be made with rulers, etc. I advise the computer.

- You are welcome to use whatever outside knowledge and/or software you have; in particular, any knowledge of graph theory you might have may be helpful.

- **Please check your PRINTED OUT homework before you turn it in to make sure (1) I can see all your lines and points, and (2) your figures are large enough to be intelligible.**

DUE MONDAY, October 26, 2010.

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1. Exercise 2.8.5

2. Exercise 2.8.10

3. Investigate the comment on p. 131 of the text:

  > It should be noted that the procedure used to justify the construction dealt exclusively with the green lines. This leaves open the possibility of using a different value of t for the red lines. Naturally, the resulting configuration will not be astral.

4. (a) Construct a configuration $DD(m\#b, c; d; \theta)$ using the construction discussed in Lab 3, and determine its symbol. [Note my construction uses an angle θ, not the ratio of stuff.]

   (b) Generalize this construction to produce a 3-orbital dihedral configuration, in the same way that we generalized the astral chiral construction to produce a 3-orbital multilateral configuration, and describe a possible symbol.

5. Article Analysis.

   This week's articles are *Astral (n_k) configurations* (1993) and *Astral (n_4) configurations* (2000), both by Branko Grünbaum—in part, to get a sense of how far things have come. They are posted on Blackboard.

Article Analysis instructions

For the article assigned, do the following. As usual, your responses must be typed, in LaTeX. Formatting would be nice.

1. Briefly summarize the article, in a paragraph or two.

   Strive for conciseness, while still hitting all the salient details. Do not just rewrite the abstract. I'd like something a tiny bit more detailed than many MathReviews, but not much. If you're approaching a page, you're writing too much and need to edit.

2. What seems to be the most important result proved/discussed in the article?

3. What is the most interesting aspect of the article, to you?

4. What is the most interesting question that occured to you as you were reading the article? (This can be an open question mentioned in the paper, or an open question that you are wondering about that was not addressed in the paper.)

Math F665 – Configurations
Final Project Information

Your final project consists of two parts:

1. A paper addressing some interesting question in configurations. You have two choices:

   A research paper in this paper, you investigate a constrained problem in configurations, doing original research. Your topic should not be too broad.

   An expository paper choose an area of configurations, and write a summary/expository paper in which you explain other people's work, in a more accessible fashion.

2. An 10–12 minute presentation, in which you distill the contents of your paper and make it accessible to your peers.

Milestones:

1. No later than **November 12**: topic proposal due. This can be by e-mail. You should have found a topic youre interested in and cleared it with me already: here, you are providing a more detailed description of what you hope to accomplish. (You need to know enough about your topic at this point to be able to explain it to me in a way that I can understand.) *200 words or so—keep it short, but understandable.*

2. **Wednesday, December 1**, in class: Outline and Literature review.

   Research *Outline:*This should be a detailed outline of your project, including what you hope to accomplish, along with some preliminary experiments or results.

   Literature review: You need to provide a list of potential references for use in your paper/presentation, and a description of what each reference is, what the broad content is, and how it will likely be useful to you; you should have at least a couple of sentences of description for each source.

   2 – 3 pages, probably, although feel free to write more if it's helpful.

   Expository *Outline:* Provide a detailed outline of your paper.

   Literature review: You need to provide a list of potential references for use in your paper/presentation, and a description of what each reference is, what the broad content is, and how it will likely be useful to you; you should have at least a couple of sentences of description for each source. You must include at least three sources in addition to the textbook (which you do not need to include, but you should if you use it as a reference), and no more than one of those three may be a web page (online journal articles do not count as web pages). Do not cite Wikipedia. You may include as many sources as you like, above 3.

3. **Monday, December 6** in class: First[1] draft of paper due.

4. **Wednesday Dec. 15, by NOON** Final Draft of paper due.

5. **Friday, Dec. 17, 10:15 a.m. - 12:15 p.m.** Presentations (This is our final exam time)

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[1]It should never be a real first draft. you should have done at least one round of editing yourself!

Paper: will be graded on interest of content, mathematical content, clarity of presentation, creativity, style/quality of presentation, and appropriateness to the assignment. 4 5 pages. (6 10 pages if capstone.) You are expected to cite the work of others when you use it (paraphrasing counts too). Presentation: will be graded on clarity, organization, delivery, accuracy in the discussion of the mathematics and presentation of the application. 8 10 minutes (10 15 if capstone). Peer evaluation of presentations: You will be expected to evaluate carefully the presentations of your peers.

What grades mean, sort of:

An A paper takes the assignment and runs with it. It brings a fresh and original approach to the topic, yet thoroughly explains the mathematics under consideration. The language is clear, informative and a real pleasure to read. The paper shows something of the writer's heart: it convinces me that writer is genuinely interested in and cares about the subject matter. The paper is appropriately formatted and contains very, very few basic writing errors and shows evidence of thorough and thoughtful proofreading.

A B paper has a definite and clearly identified subject, an interesting approach to a topic, and a thorough effort to cover the bases of the assignment. The author uses the source materials to substantiate his/her views and understanding of the material, though it may not contain the most subtle or clear analysis and exposition of ideas. The language of a B paper is clear, clean, and occasionally elegant but not necessarily interesting throughout. It may have a few basic errors in writing and proofreading.

A C paper has a weakly articulated subject, or lacks focus or clarity about what its subject matter is. It makes a thorough if not completely successful effort to fulfill the assignment. Typically, it over-relies on summary and fails to use textual substantiation in a way that enlightens and edifies without becoming stilted or boring. Mathematical ideas are communicated poorly or betray significant confusions of the author. The paper makes claims that are insufficiently supported or explained. There are a significant number of basic writing errors.

A D or F paper has significant flaws that interfere with the reader's ability to appreciate the content of the authors ideas. It lacks a thesis, the paragraphs lack basic organization and the structure of the paper is unclear. The mathematical content of the paper is presented with little, no or inappropriate textual support. There is evidence the author doesn't really understand the mathematics being presented. It trivializes the assignment. The paper is riddled with errors in basic writing and proofreading.

Lab 3: Constructing symmetric 3-configurations

1 Multilateral and Snake configurations

The voltage graph skeleton for multilateral configurations (left) and snake configutations (right). Unlabelled edges are assumed to have label 0.
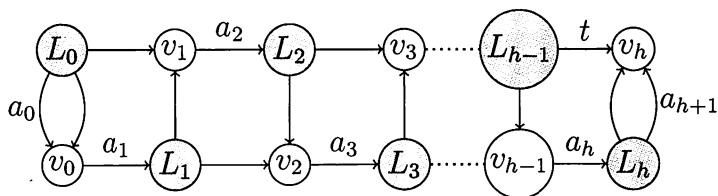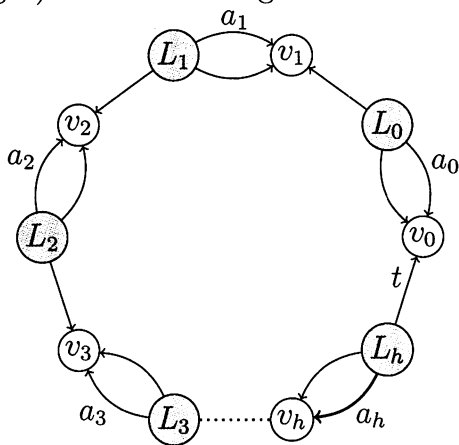
Using Sketchpad, construct examples of the following objects. For each object you construct, determine its voltage graph.

1. A chiral astral 3-configuration;

2. A 4-orbital chiral "multilateral" 3-configuration;

3. A 3-orbital chiral "snake" 3-configuration.

2 Astral "Multilateral" dihedral configurations

We can construct a dihedrally symmetric configuration based on the multilateral chiral configurations.

1. Construct a circle with center O and place two points V_0 and v_0 rather near each other on the circle. (I suggest having V_0 roughly where $(1, 0)$ would be, and v_0 a little above it.

2. Constuct the angle bisector of $\angle V_0 O v_0$ and mark it as a mirror (use the Transform menu, or just double-click on it.

3. Construct a regular m-gon with vertices $V_0, V_1, \ldots, V_{m-1}$ ("red"). **Before you click off**, reflect these (over the already marked mirror) and: (1) label the new ones as $v_0, v_1, \ldots, v_{m-1}$; (2) make them medium; (3) color them a similar but not the same color to your vertices V_i ("orange"). Note that if the old vertices were labelled counterclockwise, these should be labelled clockwise.

4. Construct lines of some span b with respect to the V_i ("red"), and after you've constructed them, reflect them to make (again, subtly different colored ("orange")) lines of span b with respect to the v_i as well.

5. We want to construct points W_i and w_i so that lines of span c connect the points W_i and w_i respectively, and also that W_0, W_c, v_d are collinear, for some d. (Note we're "crossing" symmetry classes here!) To do this:

   (a) Construct the circumcircle of $\triangle v_0 O v_c$. Take an intersection of this circle with one of the ("red") span b lines connecting the V_i.

   (b) Use this to define the points W_i

   (c) Reflect them to define the points w_i

   (d) A line of span c with respect to the W_i will intersect the points v_i. Construct the class of lines.

   (e) Reflect this class of lines to get the rest of the symmetry class.

6. Play around with what happens as you change the angle between V_0 and v_0.

Question. *Can you come up with a coherent labelling scheme for this construction method and explain why it works?*

3 Moebius configurations

Think back to the first lab. Construct a chirally symmetric version of the Pappus configuration. Can you figure out how to construct a similar configuration with a different underlying group? Can you generalize it?