COURSE OUTLINE FOR MATH 115 Spring 2011

Instructor: Rich Tschritter, Ewing-244 Office hours: Monday to Thursday, 8:00 am to 8:20 am;& 10:55 am to 11:55 am
Class Times: Monday to Thursday: 8:30 am to 10:50 am, Room E-348.

Email: tschritter@camosun.bc.ca
Website: http://faculty.camosun.ca/richardtschritter

Text: Sullivan, M. Algebra & Trigonometry, 8th edition
Calculator: Scientific- Sharp EL-531W

CHAPTER A: APPENDIX A Review

#	Text	Time	
1	R-4-5	1.5	Polynomial Expressions
2	R-6	0.5	Synthetic Division
3	R-7	1.5	Rational Exponents & Radicals
4	R-8	1	n^{th} roots, Rational Exponents

CHAPTER 1: Equations & Inequalities Chapter 2: Graphs

#	Text	Time	
4	1-2	1	Quadratic Equations

TAKE-HOME TEST # 1

5	1-4	1	Other Types of Equations
6	2-1	0.5	Distance & Midpoint Formulas
7	2-2	1	Graphs, Intercepts, & Symmetry
8	2-3	1	Lines: graphing, finding equations of lines
9	2-4	3	Conics, Text & Handout
		12 hours	
		1	TEST 1, Lessons 1 to 9

Chapter 3: Functions and Their Graphs

10	3-1	1	Functions
11	3-2	0.5	Graphs of Functions
12	3-3	1	Properties of Functions
13	3-4	1.5	Library of Functions
14	3-5	3	Transformations
15	3-6	0.5	Building Functions

TAKE-HOME TEST #2

Chapter 4: Quadratic Functions

16	4-3	1	Quadratic Functions & Their Properties
17	4-4	1	Quadratic Models
18	4-5	1	Inequalities Involving Quadratic Functions

10.5 hours

1 **Test # 2, Lessons 10 to 18**

CHAPTER 5: POLYNOMIAL AND RATIONAL FUNCTIONS

#	Text	Time	
19	5-1	1	Polynomial Functions of Higher Degree
20	5-2	1.25	Properties of Rational Functions
21	5-3	1.25	Graph of a Rational Function
22	5-4	1	Rational and Polynomial Inequalities
23	5-5	2	Real Zeros of a Polynomial Function

Take-Home-Test # 3

CHAPTER 6: EXPONENTIAL AND LOGARITHMIC FUNCTIONS

#	Text	Time	
24	6-1	1	Composite Functions and Their Graphs
25	6-2	1.5	Inverse Functions: 1-1 Functions
26	6-3	1	Exponential Functions
27	6-4	2	Logarithmic Equations
28	6-5	1.5	Properties of Logarithmic Functions
29	6-6	1.5	Logarithmic and Exponential Equations
30	6-7	0.75	Compound Interest
31	6-8	1.5	Growth and Decay

17.25 hours

Test # 3, Lessons 19 to 31

CHAPTER 7: TRIGONOMETRIC FUNCTIONS

#	Text	Time	
32	7-1	1	Angles and Their Measure
33	7-2	1	Right Triangle Trigonometry
34	7-4	2	Trigonometric Functions of Any Angle

TAKE-HOME-TEST # 4

35	7-6	1.5	Graphs of Sine and Cosine Functions
36	7-7	1	Graphs of Other Four Trigonometric Functions
37	7-8	1.5	Phase Shift; Sinusoidal Curve Fitting

CHAPTER 8: ANALYTIC TRIGONOMETRY

#	Text	Time	
38	8-1	1.5	Inverse Sine, Cosine and Tangent Functions
39	8-2	0.5	Inverse Trigonometric Functions II

#	Text	Time	
40	8-3	1	Trigonometric Identities
41	8-4	1.5	Sum and Difference Formulas
42	8-5	2	Double and Half Angle Identities
43	8-7	1	Trigonometric Equations I
44	8-8	1	Trigonometric Equations II
		16.5 hours	

1 TEST 4, Lessons 32 to 44

CHAPTER 13: SEQUENCES and SERIES (This section will be tested on the final exam)

45	13-1	1.5	Sequences
46	13-2	1.25	Arithmetic Sequences and Finite Series
47	13-3	1.25	Geometric Sequences and Series
48	13-5	0.5	Binomial Theorem
		4.5 hours	

Total Lecture and class testing Hours = 63

Time permitting, limits, secant line, tangent line, instantaneous velocity, and derivative function ***may be*** covered!

Review: 2-3 hours

Final exam, Lessons 1 to 48

NOTE: There are Math videos on these topics at the following websites:
http://www.brightstorm.com/ and http://www.khanacademy.org/

NOTE: for the conic sections an interesting website to look at which shows the intersection of a plane and a cone is:

http://clem.mscd.edu/~talmanl/HTML/ConicSections.html

FIRST DAY HANDOUT FOR MATH 115 STUDENTS

Welcome to my class. I hope that the term goes well for you. Please take some time to read the following. I think you will find it helpful and informative.

A. SOME GENERAL COMMENTS

1. HOW IMPORTANT IS REGULAR ATTENDANCE? It is essential that you attend every class. If for some reason you miss a class, you will need to act quickly to get caught up. Get a copy of the notes from one of your classmates. Work through the notes very carefully.

2. HOW MUCH TIME SHOULD I BE SPENDING ON MATH EVERY WEEK? If up to date, a typical student will need to spend a minimum of 3 to 5 hours per day. It is highly preferable that this be done before the next class.

3. **TEXTBOOK**. We have recently moved to the eighth edition of Algebra & Trigonometry by Sullivan.

4. CALCULATORS. Scientific- Sharp EL-531W. Graphing and programmable calculators **may not be used** on any test or on the final exam.

B. HOW TO GET HELP

1. Please ask questions in class. While we may not have enough time in class to answer all questions we can arrange time for help outside class.

2. Please come to my office (Ewing-244) for help. You may make an appointment, or just drop in. My official office hours are from 8:00 am-8:20 am Monday to Thursday, and 10:55 am to -11:55 am Monday to Thursday

.

3. I strongly urge you to find one or more people in this class who you can study with. For many people, learning mathematics in a social setting with their peers can be very rewarding and productive.

4. Free tutoring is available in The Mathlab, Tech 142, on Interurban campus and in Ewing 224 and 342 at Lansdowne campus. The lab is open **(see schedule posted on doors)**

C. EVALUATION PROCEDURES FOR THE COURSE

1. TERM MARK. You will be doing a number of take-home tests (4). These can be done in consultation with other students in your class, but with the help of nobody else. They will be overdue if not handed in at the beginning of the class on the due date, but can be handed in up to one day late with only a 10% mark deduction on your score.

The term mark is the average of the scores on your in-class tests and take-home-tests (4). The take-home-tests are worth 15% and the class tests are 35% and the final exam is 50%. However, if your take-home test scores are satisfactory (overall average is at least 60%), you will be allowed to throw out your worst class test before the average is calculated, provided **that you have handed in all HW assignments on time and have written all class Tests!.**

If you miss an in-class test for ANY reason, you must contact me (e-mail) as soon as possible. There will be no make-ups tests, if you miss a class test then the final exam will count 10% more for each class test missed!

2. FINAL EXAM. The final exam for this course is to be written by all students on the day and time scheduled. The examinations for this term will be held **June 27-29**, 2011. Please make sure you are available during this period. The exam schedule should be posted in ***late May for the day of our final EXAM!***

3. MARK FOR THE COURSE. **Providing you have met all the requirements listed above** your course mark is the larger of:

a) The average of your term mark and your final exam mark (each is worth 50%)
b) Your final exam mark

4. LETTER GRADE. Your course mark is then translated to a letter grade using the following table:

A+ 90-100%	B+ 77-79.5%	C+ 65-69.5%	F <49.5%
A 86-89.5%	B 73-76.5%	C 60-64.5%	
A- 80-85.5%	B- 70-72.5%	D 50-59.5%	

D. USING THIS COURSE AS A PREREQUISITE

You will need a recent B in this course in order to proceed to Math 100. You should be advised that the success rate for students in Math 100 who have not received at least a B in Math 115 or Math 12 is very low.

You will also need a recent B in order to proceed to Math 110.

A Recent C in Math 115 is sufficient for entry to Math 108, but you can expect with this sort of mark to have to work very hard.

E ONE MORE THING

In order to make the class lecture more useful it is absolutely essential that you do all HW from the Text and ask questions in class as well and seek extra help as soon as possible. I hope you will take advantage of all help that is available and see me for any questions or help that you might need. Good luck and may the Math be with you!

F H0W TO GET THE MOST OUT OF THIS COURSE!

1. Your success in this course rests largely with you.

2. Please do not be afraid to ask questions and be patient with other members of the class who may be struggling with this course.

3. Only one person should talk at a time. Please avoid private conversations while someone else is talking.

4. My objective is to make this course as useful to you as possible.

5. Intended Learning Outcomes

Upon completion of this course the student will be able to:

1. Read and write mathematics at a level sufficient for entry into first-year calculus.
2. Factor and simplify expressions with rational exponents.
3. Write equations of circles and ellipses in standard form and graph these relations.
4. Define the term function. Determine if relations are functions. Find the domains of functions. Define even and odd functions and test functions to determine if they are even, odd or neither. Form and simplify difference quotients and explain their graphical interpretation and significance.
5. Identify the graphs of common algebraic functions. Evaluate and graph piecewise defined functions.
6. Construct algebraic functions to model simple real-life problems.
7. Translate verbal descriptions of transformations to function notation and vice versa. Interpret and graph multiple transformations of functions.
8. Analyze and graph quadratic functions. Solve optimization problems modeled with quadratic functions.
9. Graph polynomial functions using end behaviour and behaviour near their x-intercepts. Analyze graphs of polynomial functions and construct possible equations.
10. Graph rational functions using symmetry, asymptotes, behaviour near their x-intercepts and tables of signs. Analyze graphs of rational functions and construct

possible equations.

11. Solve polynomial and rational inequalities.
12. State the Remainder, Factor and Rational Zeros Theorems and use these theorems to factor polynomials and find their real zeros.
13. Compose and decompose functions. State the definition of an inverse function. Verify that two functions are inverses using the definition. Find inverse functions algebraically and graphically.
14. Explain the relationship between exponential and logarithmic functions. Graph exponential and logarithmic functions and their transformations.
15. Prove the properties of logarithms and use these properties to simplify expressions and solve equations.
16. Solve applied problems involving pH, the Richter scale, decibels, compound interest, exponential growth, exponential decay and logistic growth.
17. Define a radian and work with radian measure. Convert between degree and radian measure.
18. State the unit circle definitions for the sine and cosine functions. Using the definitions, deduce properties of the sine and cosine functions and sketch their graphs. Graph transformations of these functions. Analyze sinusoidal graphs and construct possible equations.
19. Define the tangent, cotangent, secant and cosecant functions in terms of the sine and cosine functions. Graph the tangent, cotangent, secant and cosecant functions using the sine and cosine graphs.
20. State the right triangle definitions for the trigonometric functions. Use reference triangles to find exact values of trigonometric functions.
21. Derive the Pythagorean identities, the sum and difference identities, the double angle identities, the power reducing identities, and the half angle identities. Use these identities to simplify expressions and verify other identities.
22. Graph the inverse sine, cosine and tangent functions. Find exact values for compositions of trigonometric and inverse trigonometric functions. Write compositions as algebraic expressions.
23. Find exact and approximate solutions of trigonometric equations, including equations involving identities and multiples of angles.
24. Identify patterns in sequences and write formulas for the general terms. Write the terms of recursively defined sequences. Express sums using summation notation. Simplify and evaluate basic sums of sequences.
25. Identify geometric sequences and series. Derive formulas for the *n*th terms of arithmetic and geometric sequences and for the sums of the first *n* terms of these sequences. Solve word problems involving arithmetic and geometric sequences and series.
26. Expand binomials using Pascal's triangle.

LEARNING SUPPORT AND SERVICES FOR STUDENTS: There are a variety of services available for students to assist them throughout their learning. This information is available in the College Calendar, Registrar's office of the College web site at http://www.camosun.bc.ca

ACADEMIC CONDUCT POLICY: It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, Registration, and on the College web site in the Policy Section.
www.camosun.bc.ca/divisions/pres/policy/2-education/2-5.html

Math 115 Syllabus

Sullivan, M. Algebra & Trigonometry, 8'th ed.

Section	Hr	Examples	Homework Do the **odd** numbered questions in the ranges unless answers are provided for both the evens and the odds.	Comments **Self Study** sections are review topics that provide a foundation for the course. The self study material is not directly tested.
R.1 Real Numbers	0	all	**No calculator** 1 – 13, 21 – 27, 41 – 47, 61 – 97	**Self Study**: set builder notation; set union & intersection; the following sets of real numbers: integers, rational numbers and irrational numbers; the following properties of real numbers: commutative, associative & distributive. Review working with fractions.
R.2 Algebra Essentials	0	omit 13	**No calculator** 37, 53, 55, 65, 67, 73 – 105, 123 – 129, 135 – 155	**Self Study**: evaluating expressions with absolute value, determining the domain of an expression and exponent rules.
R.3 Geometry Essentials	0	all	13, 27, 29, 31, 35, 37, 41, 43, 47, 49, 51	**Self Study**: Pythagorean Theorem; formulas for the area and perimeter of a rectangle, area of a triangle, area and circumference of a circle and volume of a rectangular box; similar triangles
R.4 Polynomials	0.5	all	**No calculator** 1 – 8, 39, 41, 55, 63, 69, 75, 79, 85, 87, 93 – 101	**Self Study**: degree of a polynomial; adding, subtracting and multiplying polynomials **In class**: polynomial division (examples 12 – 14, exercises 93 – 101). Need in Sections 5.2 and 5.5.
R.5 Factoring Polynomials	1	all	**No calculator** 21, 31, 33 – 37, 45, 47, 53, 57 –125	Review factoring rules and work on building up speed. Common binomial factors (example15, exercises 117 – 125) may be new. You will cover harder problems of this type in section R.8
R.6 Synthetic Division	0.5	all	**No calculator** 1 – 4, 7, 17 – 21	Could wait and cover in section 5.5.
R.7 Rational Expressions	1	all	**No calculator** 9, 11, 15, 19, 21, 29, 33, 41, 49, 57, 59, 65 – 71, 75 – 97	**Self Study**: reducing, opposites (additive inverses), multiplying and dividing, adding and subtracting, least common multiple, complex fractions
R.8 *n*'th Roots; Rational Exponents	1	all	**No calculator** 1 – 73, 75 – 97	**Self Study**: simplifying radicals, rationalizing denominators, simplifying expressions with rational exponents **In class**: Factoring expressions containing rational exponents (examples 9 &10, exercises 75 - 97)
Review			**Chapter Review 37-103 odd**	**Pp 82-83**

Section	Hr	Examples	Homework Do the **odd** numbered questions in the ranges unless answers are provided for both the evens and the odds.	Comments **Self Study** sections are review topics that provide a foundation for the course. The self study material is not directly tested.
1.1 Linear Equations	0	all	29 – 35, 43, 51, 55, 63, 69, 71, 77 – 89, 97	**Self Study**: Notice in example 2 that the easiest method to solve the **equation** is to multiply both sides of the equation by the LCM (least common multiple) to clear denominators. However, when simplifying a rational **expression** (see example 8 on page 66) we cannot eliminate the denominators; instead, we use the LCM to build up each fraction and then we combine the expressions.
1.2 Quadratic Equations	1.5	all	1 – 7, 15, 23, 27, 33, 41, 45, 61, 65, 69, 75, 85, 91 – 97, 101, 105, 107, 119	Know the four methods (factoring, square root method, completing the square and using the quadratic formula) for solving quadratic equations. Know the derivation of the quadratic formula.
1.4 Other Equations	1	all	23 – 29, 35, 41 – 45, 51, 59, 61, 73 – 87, 97	Radical equations, equations quadratic in form, factorable equations
1.5 Solving Inequalities	0	all	1 – 10, 11 – 15, 29, 37, 39, 45, 65, 67, 71, 75, 81, 99, 101, 103, 105, 109, 113	**Self Study**
1.7 Applied Problems	0	1 only	7, 9, 15, 31, 35	**Self Study**: geometry problems only
Review			Chapter 1 Review 11-37, 43-51, 83,99	**Pp 150-151**
2.1 Distance & Midpoint Formulas	0.5	all	1 – 10, 19, 27, 29, 35, 39, 45, 47, 59, 61, 63	Know the distance and midpoint formulas and be able to derive their formulas.
2.2 Graphs, Intercepts & Symmetry	1	all	1 – 10, 11, 23, 27, 33, 45, 55 – 81, 85, 87	
2.3 Lines	1.5	all	1 – 10, 11, 13, 25, 31, 37 – 43, 47 – 69, 77, 79, 83, 85, 93, 97, 101, 107, 109, 115, 117, 119a, 121, 125, 131	
2.4 Circles	1.25	all	1 – 6, 7, 9, 11, 15, 19, 23, 25, 27, 35, 37, 43, 47, 49	
Ellipses (handout)	0.75			
Review			Chapter 2 Review 3-43, 53,57	Pp 202-203
3.1 Functions	2	all	1 – 14, 15 – 19, 27 – 37, 39, 41, 47 – 57, 61, 67, 71 – 91	
3.2 Graphs of Functions	0.5	omit 4	1 – 8, 9 – 25, 29 (omit graph), 31(a-d), 35, 39, 41	
3.3 Properties of Functions	1.5	omit 5	1 – 10, 11 – 23, 29, 33 – 43, 53, 59, 61, 63a, 75a, 77a, 79a, 81, 85	
3.4 Library of Functions	1.5	all	1 – 8, 17 – 39, 41 – 45, 47, 49(a-c), 53, 55	Omit greatest integer function,
3.5 Transformations	2	all	1 – 6, 7 – 33, 41, 51 – 57, 65, 69, 71, 73, 87	We won't emphasize graphing functions with two horizontal transformations where order is important (example 13).
3.6 Building Functions	1	all	1(a,b,c), 3a, 5, 7(a&b), 9(a&b), 11(a&b), 13, 15, 23	
Review			Chapter 3 Review 1-11, 15-35, 41-73, 75 a-d Chapter Test 12	Pp 271-274 P 275

Section	Hr	Examples	Homework Do the **odd** numbered questions in the ranges unless answers are provided for both the evens and the odds.	Comments **Self Study** sections are review topics that provide a foundation for the course. The self study material is not directly tested.
4.1 Linear Functions	0.5	all	1 – 12, 17, 19, 21, 29, 31, 33, 37 – 53	
4.3 Quadratic Functions and Their Properties	1	all	1 – 10, 11 – 17, 27, 29, 39, 43, 47, 53, 55, 61, 63, 69, 77, 81, 83, 85	Know the co-ordinates of the vertex of a parabola: $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$ Be able to find the vertex by competing the square as well as using the formula.
4.4 Quadratic Models	1	omit 5	3 – 17	
4.5 Inequalities Involving Quadratic Functions	0.5	all	3 – 17, 23, 33	Light treatment; we solve polynomial and rational inequalities in 5.4 Omit method 2 in example 2
Review			Chapter 4 Review 9-43, Chapter Test 6,7,10	Pp 319-320 P 321
5.1 Polynomial Functions	2	omit 11	1 – 10, 11 – 21, 33, 35, 39 – 43, 47, 49, 55, 57 – 63, 69, 75, 77, 85, 87	**Omit behavior of graph at each intercept**
5.2 Properties of Rational Functions	1.25	all	1 – 10, 11 – 37, 41 – 51, 53	
5.3 The Graph of a Rational Function	1.25	all	1 – 6, 7, 9, 21, 23, 25, 29, 33, 37, 45, 47, 49a, 51(a&b), 53a, 55a	In example 7, you need to use the formulas for the volume and surface are of a cylinder. You should be able to derive these formulas using the formulas for the area and circumference of a circle
5.4 Rational and Polynomial Inequalities	1.5	all	2, 15, 17, 23 – 33, 43, 45	
5.5 The Real Zeros of a Polynomial Function	2	omit 3,8,10	1 – 10, 11, 15,23,27, 33, 37, 39, 45, 47, 57, 59, 61, 69, 77, 89, 103, 105	Know the Division Algorithm of Polynomials, the Remainder Theorem, the Factor Theorem, the Rational Zeros Theorem and the Intermediate Value Theorem. Omit Descartes Rule of Signs and the Theorem for Bounds on Zeros.
Review			Chapter 5 Review 1-59, 55-63, 69-75, 89 Chapter Test 2, 5-11(all)	Pp 396-397 P 398
6.1 Composite Functions	0.5	all	1 – 6, 7 – 11, 23, 27, 35, 41, 43, 53 – 57, 59, 65 – 73	
6.2 Inverse Functions	1.5	all	1 – 8, 9 – 31, 39, 41 – 45, 51, 53, 57, 63, 65, 71 – 85, 93	
6.3 Exponential Functions	1	all	1 – 10, 11, 17 – 35, 43, 49 – 53, 61, 67, 71, 75, 79, 83, 87 – 91, 97 – 101, 115	
6.4 Logarithmic Functions	2	all	1 – 8, 9, 15, 17 – 47, 51, 55, 59, 63 – 69, 71, 83, 87 – 117, 127, 131, 133	
6.5 Properties of Logarithmic Functions	1.5	all	1 – 67, 79, 81 – 91, 95	Know how to prove Theorems 1 – 5 and 8
6.6 Logarithmic and Exponential Equations	1.5	All Omit # 7	1 – 45, 53, 55, 59, 75, 77, 79, 81(in class), 87, 97, 99	

Section	Hr	Examples	Homework Do the **odd** numbered questions in the ranges unless answers are provided for both the evens and the odds.	Comments **Self Study** sections are review topics that provide a foundation for the course. The self study material is not directly tested.
6.7 Compound Interest	0.75	omit 4,5	3, 11, 15, 19, 23, 31, 35, 41, 43, 45	Know the derivation of the compound interest formula (2). Compound interest and continuous interest formulas will be given on tests. If the term "present value" is used on a test, its definition will be given. However, the formulas for present value will not be given because math students don't need them!
6.8 Growth and Decay	1.25	all	1 - 17, 17, 21 – 25	All formulas will be given on tests.
Review			Chapter 6 Review 1-51, 55-87, 91-97 Chapter Test 1-23,	Pp 496-499 P 500-501
7.1 Angles and Their Measure	0.5	omit 2, 6, 7, 8	19, 21, 23 – 57, 61, 65, 67, 71, 75, 91	
7.2 Right Triangle Trig I	1.5	all	1 – 10, 13, 25, 31, 37 – 59, 63, 67	Know the right triangle definitions (1), the reciprocal and quotient identities (2,3) and the Pythagorean Identities (5 – 7). The identities are summarized in a box titled Fundamental Identities. Know the Complementary Angle Theorem. (Table 2 is just a restatement of the theorem.)
7.3 Right Triangle Trig II	0.5	omit 6 c ,	1 – 41, 49, 55, 59, 61, 77	
7.4 Trig Functions of Any Angle	1.5	all	1 – 10, 11, 15, 21 – 89, 99, 109, 111	
7.5 Unit Circle Approach	1	all	1 – 8, 9, 11, 27, 29, 37 – 55, 61, 63, 67, 73, 79, 83, 89, 99	
7.6 Graphs of the Sine and Cosine Functions	1.5	all	3 – 8, 9 – 41, 45, 49, 53, 57, 59, 61, 67 – 79, 85, 89, 93, 101	
7.7 Graphs of the Other Four Trig Functions	1	omit 3	1 – 15, 21, 29, 31, 33, 45	Understand how to use the graphs of the sine, cosine and tangent functions to graph the other three trig functions. Know the graphs and properties of tangent, cotangent, secant and cosecant functions.
7.8 Phase Shift; Sinusoidal Curve Fitting	0.5	omit 3,4,5	1 – 17, (# 11 is a challenge)	
Review			Chapter 7 Review 1-87, 93-99 Chapter Test 1-27,31	Pp 594-597 P 598
8.1 Inverse Sine, Cosine and Tangent Functions	1.5	all	1 – 12, 13 – 55, 61 – 65	Know the domain and ranges of these three inverse trig functions.
8.2 Inverse Trig Functions II	0.5	omit 4,5	9 – 35, 45, 47, 57, 59, 67, 69, 79	
8.3 Trig Identities	1	all	1 – 8, 9 – 17, 35 – 57, 63 – 69, 79, 81, 89, 91, 97,	

Section	Hr	Examples	Homework Do the **odd** numbered questions in the ranges unless answers are provided for both the evens and the odds.	Comments **Self Study** sections are review topics that provide a foundation for the course. The self study material is not directly tested.
8.4 Sum & Difference Formulas	1.5	all	1 – 8, 11, 15, 17, 21 – 29, 31a&b, 35c, 37a&b, 39, 45, 53, 55, 59, 61, 67 – 75, 83, 85, 95	You are responsible for the **proofs** of the theorems and they will be tested on a trig proof quiz. We will give you the sum formulas for the cosine, sine and tangent function of the final exam even though we really really want you to memorize them.
8.5 Double Angle & Half Angle Identities	2	all	1 – 6, 7, 9, 15, 23, 27, 29 – 37, 41, 43, 47 – 55, 61– 63, 69, 71, 86, 87 7.6 p573: 97 You can now do 97c using the power reducing formulas.	Know the double angle identities for sine, cosine and tangent functions and how to derive them using the sum identities in the previous section. Know the power reducing formulas for sine and cosine function (6,7) and how to derive them. You will be given the half angle formulas on tests and the final exam.
8.7 Trig Equations I	1.5	all	3 – 6 , 7 – 55, 63	
8.8 Trig Equations II	0.5	omit 7	5 – 23, 29 – 35, 41, 45	
Review			Chapter 8 Review 1-37, 41-61, 73-125, 135 Chapter Test 2,3,4,6,7,9,11-29	Pp 664-666 P 666-667
13.1 Sequences	1.5	all	1 – 8, 17, 19, 25, 27 – 75, 81, 91(for fun)	Proofs for (1) – (6) will be done in class. Formulas will be provided.
13.2 Arithmetic Sequences & Finite Series	1.25	all	1 – 2, 5, 7,15 – 31, 35, 39, 41, 51, 61, 63	Know the definition of an arithmetic sequence (1) Know the formula for the *n*'th term of an arithmetic sequence (2) and understand why the formula makes sense. You will be given the formula (4) for the sum of the first *n* terms of an arithmetic sequence even though it is easy to learn (average the first and last terms and multiply by the number of terms).
13.3 Geometric Sequences & Series	1.25	omit 6 – 11	9, 11, 15, 19 – 41, 47-59, 85, 95	Know the definition of a geometric sequence (1) Know the formula for the *n*'th term of a geometric sequence (2) and understand why the formula makes sense. You will be given formula for the sum of the first *n* terms of a geometric sequence (3) but notice how easy it is to derive. Omit infinite geometric series
13.5 Binomial Theorem	0.5	2,3	17-21	Use Pascal's Triangle to evaluate the binomial coefficients
Review			Chapter 13 Review 1-39,57,59,65,67	Pp 968-969
Lecture Hours	61	Tests 5 hrs	Review 2 hours	Total = 68 hours

Math 115 Study Guide, Rich Tschritter's Class

By studying the following core material, you will be preparing yourself for at least 90 percent of the questions on any term test or the final exam. Moreover, any non-core questions will be similar to ones done in class and/or the homework.

Test 1: Review, Chapter 1, Functions , Symmetry & Conics (30-40 marks)

1. Add rational algebraic expressions and/or simplify a complex fraction, one to two questions (3-5 marks)
2. Solving equations: linear, quadratic, radical & others, one to two questions (5-7 marks)
3. Simplifying rational algebraic expressions, one to two questions. (3-5 marks)
4. Find the intercepts and test for symmetry of a relation, one question. (2-3 marks)
5. Find a linear equation given certain types of information, one question. (3-5 marks)
6. A division of two polynomials involving synthetic division, one question. (2-3 marks)
7. Application of solving equations, one question.(3 - 5 marks)
8. Graph a conic, circle &/or ellipse, write the equation in standard or graphing form, give coordinates of center, vertices, equations of axes of symmetry, intercepts, domain and/or range, one question. (3-5marks)

.

Test 2: Chapter 3:Functions and their Graphs, Chapter 4: Quadratic Functions &Equations

(30 - 40 marks)

1. Operations with functions, $f \pm g, f \cdot g, \frac{f}{g}$, and finding their domain, one to two questions. (2-4 marks)
2. One question on finding the difference quotient of a function: $\frac{f(x+h) - f(x)}{h}$. (3-4 marks)
3. Identifying the symmetry of a function, odd, even, neither, and average rate of change of a function, one to three questions. (4-7 marks)
4. One question on graphing a piece-wise function. (2 - 5 marks)
5. Transformations: one question.

a) Be familiar with the graphs of the core functions, x^2, x^3, x^4, $\sqrt{x}$, $|x|$, and $\frac{1}{x}$.

b) Graph a variation of the above using transformations. This may involve completing the square. Start with the basic function first(three points, 6 if reciprocal function). Do stretching, shrinking and/or flipping, then translations last, describing each transformation used to obtain your final graph. (3 - 5 marks)

6. Building a function from a given relation, one question. (2-3 marks)
7. Applications of quadratic equations, be able to find the vertex by completing the square, or using $x = -\frac{b}{2a}, y = f\left(-\frac{b}{2a}\right)$, one question. (3-5 marks)
8. Solve a quadratic or quadratic type inequality and give the solution in interval notation and /or on real number line. (2-4 marks)

Test 3: Chapter 5: Polynomial, Rational, Composite, and Inverse Functions and Chapter 6 Exponential and Logarithm Functions **(**45 marks)

1. Solve, and /or graph a polynomial function finding all real zeros and intercepts, identifying the end behavior of the function using the leading coefficient test, symmetry, number of turning points, and plotting only a few (if necessary) points, one to two questions. (4 marks)
2. Graph a rational function and give all asymptotes (vertical, horizontal or slant), give intercepts, identify symmetry, one question. (4 marks)
3. Solve a polynomial inequality and give the solution in interval notation and/or on real number line, one question. (3 - 4 marks)
4. Solve a rational algebraic inequality, give the solution in interval notation and/or on real number line, one question. (4 marks)
5. Find a composite function and its domain, one question. (3 marks)
6. Find an inverse function (given $f\ \ x$ find $f^{-1}\ \ x$), and be able to verify: show that $f\left[\ f^{-1}\ \ x\ \right]=x$ and $f^{-1}\left[\ f\ \ x\ \right]=x$, and give domain of f and range of f^{-1} and vice versa, one question. (3 marks)
7. Application involving the use of a polynomial function from given information, one question. (0-5 marks)

Logarithms, Exponential Functions
Know the following formulas.

- Population growth: $P=P_0e^{kt}$
- Compound interest:
  - Regular: $A=P(1+\frac{r}{n})^{nt}$
  - Continuous: $A=Pe^{rt}$
- Richter scale: $R=\log(\frac{I}{I_0})$
- Radioactive decay: $P=P_0e^{kt},\ k<0$

1. Graph an exponential and/or logarithm function starting with the basic equation, and show and describe each transformation you use to obtain your final graph, and identify all intercepts and asymptotes, one to two questions. (4 marks)
2. Two to three questions solving exponential and logarithm equations, note restrictions and be able to find intercepts. (4-9 marks)
3. Simplify exponential and logarithm expressions using the appropriate properties covered in this section, two to three questions. (2-3 marks)

- $\log_b\ \ x\cdot y\ =\log_b x+\log_b y$
- $\log_b\ \ x^{\ n}=n\log_b x$
- $\log_b\left(\frac{x}{y}\right)=\log_b x-\log_b y$
- $\log_B A=\frac{\log_n A}{\log_n B}$
- $b^{x_1}=b^{x_2}\ \ \Rightarrow\ \ x_1=x_2$
- $\log_b X=\log_b Y\ \ \Rightarrow\ \ X=Y$

- $a^{\log_a x} = x, \quad \log_a a^x = x$
- $e^{\ln x} = x, \quad \ln e^x = x$

4. Prove one of the major logarithm properties, multiplication, quotient, power, or change of base rule, one question. (2-4 marks)
5. Application of growth or decay problem, see formulas at beginning of this section, one to two questions. (4-6 marks)

Test 4: Trigonometry (45 marks)

Trigonometry, memorize:

- *the sines/cosines/tangents and their reciprocal functions of* $\pi/6, \pi/3, \pi/4$
- *right triangle trigonometry*
- *radian and degree measure of angles*
- *trigonometric functions of any angle*

Some questions like:
1. A simple question involving the relationship $s = r\theta$. Recall θ must be in radian mode.
2. Convert from degrees to radians, or vice-versa.
3. A question(s) like: "Find the exact value of $\cot(11\pi/6)$ (no calculator)".
4. A question like: "If $\tan\theta = \frac{-3}{8}$, θ in II. Find $\cos\theta$ using the x-y-r method".

Watch out for $\sin^{-1} x$. *It means* $\arcsin x$. *It does <u>not</u> mean the reciprocal of* $\sin x$, $\csc x$. *Also, memorize:*

- *the sines/cosines/tangents of* $\pi/6, \pi/3, \pi/4$
- *the graphs of* $\sin x$, $\cos x$, $\tan x$, $\sec x$, $\csc x$, $\cot x$, $\arcsin x$, $\arccos x$, $\arctan x$
- *that* $-\frac{\pi}{2} \le \arcsin x \le \frac{\pi}{2}$, $0 \le \arccos x \le \pi$, $-\frac{\pi}{2} < \arctan x < \frac{\pi}{2}$
- *the formulas mentioned in the theory section below.*

5. Graph transformations of the six trig functions and arcsine, arccosine & arctangent. *Always graph at least two periods worth*. Give amplitude (for sine and cosine only), period, interval, and phase shift (for the six trig functions), and vertical translation. (4-6 marks)
6. Evaluate an expression(s) like $\tan(\arcsin(-\frac{3}{8}))$. Do it without using a calculator. (1-3 marks)
7. Simplify an expression where you will have to use a combination of algebraic techniques and trigonometric identities. (2-3 marks)
8. Establish (prove or verify) an identity by simplifying each side independently using identities, two questions. (8 marks)
9. Theory, taken from the following list
   - Derive $\sin^2 x + \cos^2 x = 1$
   - Derive $1 + \tan^2 x = \sec^2 x$ or $1 + \cot^2 x = \csc^2 x$ using the above identity
   - "Derive" the odd/even formulas $\sin(-x) = -\sin(x)$ and $\cos(-x) = \cos(x)$ using either the unit circle or the function graphs. *Although this does not constitute a formal proof, it will suffice for this course.*
   - Derive the odd/even formulas for the other four trig functions using the above formulas.
   - "Derive" the co-function formulas $\sin(\frac{\pi}{2} - x) = \cos x$ and $\cos(\frac{\pi}{2} - x) = \sin x$ using graphs. *Although this does not constitute a formal proof, it will suffice for this course.*

(0-3 marks)

10. Solve a trigonometric equations. You may be asked to give all answers, or to restrict your answers to $0,2\pi$ (2 or 3 questions). (8 marks)

11. Evaluate an expression like $\tan 75^\circ$ or $\cos(22\frac{1}{2}^\circ)$ without using a calculator. (3 marks)

12. A question like: "find $\tan(2\theta)$ if $\cos\theta = -\frac{3}{7}$ and θ is in the third quadrant" or "find $\sec(\alpha - \beta)$ if α is in the second quadrant & $\sin\alpha = \frac{1}{3}$ and β is in the third quadrant & $\tan\beta = 4$." Do it without using a calculator. (2-3 marks)

13. Evaluate an expression like $\cos\left[\arcsin(-\frac{3}{8}) + \arctan(\frac{3}{2})\right]$. Do it without using a calculator. (0-2 marks)

14. Evaluate an question like: given $\tan\theta = 3, \frac{3\pi}{2} < \theta < 2\pi,$

find the exact value of $\sin \theta/2$. (2-3 marks)

15. Theory, taken from the following:
- The sum formulas:
  - Derive the formula for $\cos(x+y)$ from the formula for $\cos(x-y)$. *You will not be asked to derive the formula for* $\cos(x-y)$.
  - Derive the formula for $\sin(x+y)$ using the co-function identities, the fact that sine is odd and cosine is even, and the formula for $\cos(x-y)$. This is a little tricky and I don't give this question as often as I give some of the others.
  - Derive the formula for $\sin(x-y)$ using the formula for $\sin(x+y)$.
  - Derive the formulas for $\tan(x \pm y)$ using similar methods.
- Derive the double angle formulas for sine, cosine and tangent using the corresponding formulas for the sum of two angles. In the case of $\cos(2x)$, then use $\sin^2 x + \cos^2 x = 1$ to get the two variations.
- Derive the half angle formulas for sine and cosine using the formulas $\sin^2 x = \frac{1-\cos 2x}{2}$, $\cos^2 x = \frac{1+\cos 2x}{2}$ (*which you will not have to prove*).

(0-3 marks total)

Final Exam (3 hours long)

1. The core of the final exam will be a subset of the core of the five term tests with approximately the same number of questions from each area.
2. Be sure to have memorized all that you were asked to memorize for Test 3 and Test 4 with the following exceptions which if required will be given to you:
   - The addition and subtraction formulas for tangent
   - The reduction formulas for sine and cosine
   - The half angle formulas for sine, cosine and tangent
3. There will be one or two questions devoted to theory, total value at most 5%. Questions will be chosen from the Theory sections above, with the exception of the following questions which will not be tested:
   - Derivation of the co-function formulas $\sin(\frac{\pi}{2} - x) = \cos x$ and $\cos(\frac{\pi}{2} - x) = \sin x$
   - Derivation of the reduction and half angle formulas for sine and cosine

Tentative Pacing Schedule Math 115 Spring /11

Wk	Month	Monday	Tuesday	Wednesday	Thursday	Friday
1	May	9 Review R4-R6 & R-7	10 Review R7-R8 **T-H-T # 1**	11 1-2, 1-4 & 2-1	12 2-2, 2-3 & 2-4	13
2	May	16 Conics, 3-1 T-H-T # 1 due	17 3-2, 3-3, 3-4	18 3-5, 3-6	19 Review ***TEST # 1*** **T-H-T # 2**	20
3	May	23 **Holiday**	24 4-3,4-4,4-5	25 5-1,5-2 **T-H-T # 2 due**	26 5-3,5-4	27
4	May	30 5-5,5-6	31 Review **TEST # 2**	June 1 6-2 6-3, **T-H-T # 3**	June 2 6-4,6-5	June 3
5	June	6 6-6,6-7,6-8	7 7-1, 7-2, 7-4	8 Review	9 7-6, 7-7	10
6	June	13 7-8, 8-1 **T-H-T # 3 due**	14 8-1, 8-2, 8-3	15 **TEST # 3**	16 8-4,8-5 T-H-T # 4	17
7	June	20 8-7, 8-8,	21 13-1, 13-2 **T-H-T #4 due**	22 13-3, Review	23 Review, **Test # 5**	24
8	June	27 **Exams**	28 **Exams**	29 **Exams**	30	

NOTE: this is a tentative schedule! We may adjust some or all of the above scheduled due dates for class TESTS and T-H-Tests !