Effective Fall 2011

DIVISION OF NATURAL SCIENCES AND MATHEMATICS

TIDEWATER COMMUNITY COLLEGE

VIRGINIA BEACH CAMPUS

COURSE PLAN

Course Number and Title: MTH 158-College Algebra

Lecture Hours: 3 Lab Hours: 0 Credit Hours: 3

Submitted by: R. Watkins, M. Kirby, C. Hewett, J Conner, D. Branton Date: 5/2/2011

Approved by: M. Kirby, C. Newsom Date: 5/2/2011
Assistants to the Dean

G. Frank Date: 5/2/2011
Academic Dean

I. COURSE DESCRIPTION

This course reviews the fundamental ideas of algebra including polynomials, rational expressions, graphing, equations and inequalities, relations and functions, and systems of first degree equations and inequalities.

II. PREREQUISITES:

Placement test or successful completion of MTH 4, MTE 9 or equivalent.

III. INTRODUCTION:

MTH 158 is designed to review and enhance the fundamental ideas and skills of algebra. It is designed for the liberal arts and education student and as a transition from developmental courses to other college credit courses.

IV. INSTRUCTIONAL MATERIALS:

Textbook: Algebra for College Students, Custom Edition, by Lial, Hornsby and McGinnis with MyMathLab, 2012; ISBN 1256130116; Pearson. This is a 3-hole punch that can be placed in a notebook. **REQUIRED**
The regular 7th edition is hardbound is is identical for the chapters we cover. ISBN 0321760166.

Scientific or graphing calculator **REQUIRED**

MyMathLab comes with the text or it may be purchased separately **OPTIONAL**
(This is an internet access to supplementary materials.
It includes the entire text and may be purchased online for $78, www.coursecompass.com .)

V. MATERIAL TO BE COVERED:

Unit I	Chapters 2 and 3 (omit 2.6, 2.7)	3 weeks
Unit II	Chapters 4, 5 and 6	3.5 weeks
Unit III	Chapter 7	2.5 weeks
Unit IV	Chapter 8	2.5 weeks
Unit V	Chapters 9, 10 and 11 (omit 9.1, 10.1 10.3, 10.4, 10.5, 11.3, 11.4, 11.5, 11.6)	3.5 weeks

VI. BASIC CONCEPTS

Chapter 1: Review of the Real Number System *Omit, review as needed when the material is used in the course.*

Chapter 2: Linear Equations, Inequalities, and Applications

2.1 Linear Equations in One Variable
2.2 Formulas and Percent
2.3 Applications of Linear Equations
2.4 Further Applications of Linear Equations
2.5 Linear Inequalities in One Variable
2.6 Omit
2.7 Omit

Chapter 3: Graphs, Linear Equations, and Functions

3.1 The Rectangular Coordinate System
3.2 The Slope of a Line
3.3 Linear Equations in Two Variables
3.4 Linear Inequalities in Two Variables
3.5 Introduction to Relations and Functions
3.6 Function Notation and Linear Functions

Chapter 4: Systems of Linear Equations

4.1 Systems of Linear Equations in Two Variables
4.2 Omit
4.3 Omit
4.4 Omit

Chapter 5: Exponents, Polynomials and Polynomial Functions

5.1 Integer Exponents and Scientific Notation
5.2 Adding and Subtracting Polynomials
5.3 Polynomial Functions, Graphs, and Composition
5.4 Multiplying Polynomials
5.5 Dividing Polynomials *monomial divisors only*

Chapter 6: Factoring

6.1 Greatest Common Factor and Factoring by Grouping
6.2 Factoring Trinomials
6.3 Special Factoring
6.4 A General Approach to Factoring
6.5 Solving Equations by Factoring

Chapter 7: Rational Expressions and Functions

7.1 Rational Expressions and Functions: Multiplying and Dividing
7.2 Adding and Subtracting Rational Expressions
7.3 Complex Fractions
7.4 Equations with Rational Expressions and Graphs
7.5 Applications of Rational Expressions
7.6 Variation

Chapter 8: Roots, Radicals and Root Functions

8.1 Radical Expressions and Graphs *Be sure to discuss domain.*
8.2 Rational Exponents
8.3 Simplifying Radical Expressions
8.4 Adding and Subtracting Radical Expressions
8.5 Multiplying and Dividing Radical Expressions
8.6 Solving Equations with Radicals
8.7 Complex Numbers

Chapter 9: Quadratic Equations and Inequalities

9.1 Omit
9.2 The Quadratic Formula
9.3 Equations Quadratic in Form
9.4 Formulas and Further Applications
9.5 Polynomial and Rational Inequalities
Supplement attached on domain and range of radical functions

Chapter 10: Additional Graphs of Functions and Relations

10.1 Omit (*Homework is provided if you wish to use it.)*
10.2 Graphs of Quadratic Functions
10.3 Omit
10.4 Omit
10.5 Omit

Chapter 11: Inverse, Exponential, and Logarithmic Functions

11.1 Inverse Functions
11.2 Exponential Functions
11.3 Logarithmic Functions
11.4 Omit
11.5 Omit
11.6 Omit

VII. SUGGESTED WEEKLY SCHEDULE – 16 WEEK SEMESTER:

Week 1: 2.1, 2.2, 2.3, 2.4
Week 2: 2.5, 3.1, 3.2, 3.3
Week 3: 3.4, 3.5, 3.6
Week 4: **Test 1,** 4.1
Week 5: 5.1, 5.2, 5.3, 5.4
Week 6: 5.5, 6.1, 6.2, 6.3
Week 7: 6.4, 6.5, **TEST 2**
Week 8: 7.1, 7.2, 7.3
Week 9: 7.4, 7.5, 7.6, **Test 3**
Week 10: 8.1, 8.2, 8.3, 8.4
Week 11: 8.5, 8.6, 8.7
Week 12: **Test 4,** 9.2, 9.3, 9.4
Week 13: 9.5, Supplement, 10.2, 11.1
Week 14: 11.2, 11.3
Week 15: **Test 5**
Final Exam to be given at the scheduled exam period

VIII. SUGGESTED WEEKLY SCHEDULE – 10 WEEK SEMESTER

Week 1: 2.1 – 2.5, 3.1
Week 2: 3.2 – 3.6
Week 3: **Test 1,** 4.1, 5.1, 5.2
Week 4: 5.3 – 5.5, 6.1, 6.2
Week 5: 6.3 – 6.5, **Test 2**
Week 6: 7.1 – 7.5
Week 7: 7.6, 8.2 – 8.5
Week 8: 8.6, 8.7, **Test 3**
Week 9: 9.2 - 9.5, Supplement, 10.2
Week 10: 11.1 - 11.3, **Final Exam**

IX. ADDITIONAL MATERIAL AVAILABLE TO STUDENTS

TCC Student ID Required to Use these Resources

1. Student's Solutions Manual Available in Math Lab

X. NOTES TO INSTRUCTORS

Remember that students should have seen most of the topics in this course. Students who are weak in the prerequisites should not be allowed to slow down the class.

1. In Chapter 2 you should emphasize applications with a brief review of the procedures for solving linear equations.
2. In Chapter 3 you may choose to permit the graphing calculator, but students should still have the basic skills. For example, include equations that do not fall in the standard window or equations in standard form, $Ax + By = C$.
3. In Chapter 6, most of our students have learned the grouping (*ac*) method for factoring. You probably will not have time to teach them a new method.
4. In Chapter 7, emphasize applications.
5. The most important part of Chapter 8 is the part on complex numbers.
6. In Chapter 9, emphasize applications. Remind students that some quadratics may be solved by factoring. Do NOT cover anything except applications in 9.4.
7. A comprehensive final exam is required for this course.
8. You may require My Math Lab in this course or simply allow students to use it if they wish.

If you have extra time, you are welcome to cover additional topics. The listed topics are the minimum requirements for the course. In particular, 14.4 might be a good addition to squaring binomials. It is no longer needed for statistics.

Richard Watkins at the Beach Campus is the College contact person for MTH 158 and will be glad to discuss any questions you may have about the course.
Email: rwatkins@tcc.edu
Phone: 757.822.7085

XI. SUGGESTED PROBLEM SETS

	Page	Problems
2.1	54	5,7,11,17,19,25,31,37,43,49,53,59,65,69
2.2	62	15,19,23,29,33,43,47,53
2.3	74	15,19,31,37,43,47,53,59
2.4	84	13,15,25,27,29,39,45
2.5	99	11,15,19,23,27,33,39,47,51,57,67,71
3.1	143	23,35,41,43,47,53,59,63
3.2	155	25,29,35,41,43,45,51,57,63,71,75,89
3.3	169	15,19,27,33,37,43,45,47,51,55,61,65,67,71,77,85,89
3.4	179	7,13,19,23,27,33,37
3.5	187	9,11,15,19,21,23,27,29,33,39,45,53
3.6	194	3,7,11,15,19,23,27,33,37,39,45,49,57,59,65
4.1	219	15,17,19,25,33,35,37//41,47,53,63,69,79,85 (You may break this into 2 assignments)
5.1	274	13,17,33,35,41,49,67,75,79,87,95,103,109,115,121,133,137,141,145,157,161
5.2	282	33,39,45,49,53,59,63,65,71,81,85
5.3	290	1,7,9,13,17,27,35,43
5.4	299	5,11,15,23,27,33,37,43,49,55,59,65,69,75,81,83,113,119
5.5	306	5,7,9,11,13
6.1	324	7,13,17,21,27,31,39,47,53
6.2	332	5,11,21,25,29,37,47,51,53,57
6.3	337	7,13,19,31,35,43,49,55,61
6.4	342	1,9,17,21,25,31,37,43,51,57,65,67
6.5	350	3,9,13,17,21,27,33,37,41,55,59,63,65
7.1	368	1,7,11,25,31,37,43,51,55,59,61,65,71,75,81,87,91
7.2	377	7,13,21,43,49,55,61,67,73,77,81,85,89
7.3	384	5,11,17,23,27
7.4	391	3,9,15,21,29,33,37,43,47,49,53
7.5	402	9,15,23,27,31,37,41,47,51,55,59,61
7.6	412	27,31,35,39,45,51,55,59
8.1	433	15,23,31,41,47,49,57,61,67,71,79,87
8.2	441	11,19,27,35,39,45,49,51,59,67,73,79,85,91,95,99
8.3	450	5,13,21,29,37,43,49,59,63,69,75,83,91,95,99,101,105,107,111,113,119,123
8.4	456	1,9,17,23,27,33,37,39,45,51,53
8.5	464	7,15,23,31,35,39,43,49,57,61,65,71,75,81,85,89,91,95,103,105
8.6	472	7,11,17,21,25,29,33,39,45,49,53,59,61
8.7	479	7,11,15,21,25,29,33,37,43,49,55,63,71
9.2	510	5,11,17,23,29,35
9.3	519	7,11,15,21,27,33,37,43,49,55,61,67,71,75,81
9.4	527	7,13,21,29,33,37,41,43,49
9.5	536	5,9,15,21,27,31,39,47
Problems from the Supplement		1-21 (odd)
10.1	553	1,7,11,17,19,21,23,25,27,29,33,37,43,49,53 (Optional)
10.2	562	3,9,13,17,21,29,35
11.1	611	7,11,15,19,25,29,33,37
11.2	619	5,9,11,15,21,27,31,35,39
11.3	626	3,11,15,21,29,37,43,49,51,65

These are suggested problems that reflect the material covered in the text. You may certainly modify this list anyway that you wish. Comparable problems are also available online through the master course for MTH 158. When used books begin showing up in Spring 2012, some students may not have a valid login for MyMathLab. Such a login is officially required for this class, but you may elect to waive it as a requirement. If you know that you do not plan to use MyMathLab, it would be helpful to let your bookstore (through your division) know that the login is not needed for your section. (They may then sell used books without the login to your students. Since most students will get the 3-hole punch version, there may not be many used books available.)

Domain of Radical Functions

As with any function, we are concerned with the domain and range of radical functions like

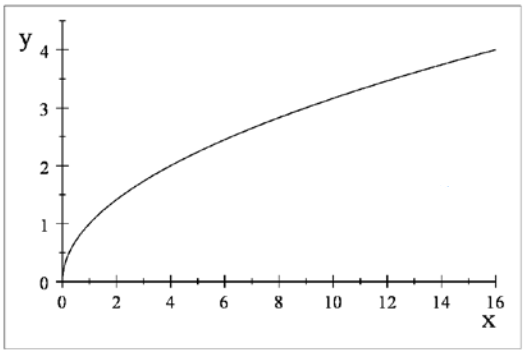
$$f(x)=\sqrt[n]{x}\ .$$

As usual, the graph may be used to approximately determine both the domain and range. The graph is usually the way we describe the range. The domain, on the other hand, is usually assumed to be the largest subset of real numbers for which the function is defined.

Thus if *n* is even, then $x\geq 0$. For *n* odd, *x* may be any real number. Both the domain and range may involve inequalities which may be written as intervals, on the number line or algebraically. We know have the ability to determine many domains both graphically and algebraically.

Example 1 Find the domain of $f(x)=\sqrt{x}$. Write the answer in interval notation.

Solution Since the index is understood to be 2, it is even.

<table>
<tr><td>Graphically find the domain (and range)</td><td>Algebraically find the domain</td></tr>
<tr><td>Make a table of values:
<table>
<tr><th>x</th><th>$\sqrt{x}$</th></tr>
<tr><td>0</td><td>0</td></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>4</td><td>2</td></tr>
<tr><td>9</td><td>3</td></tr>
<tr><td>16</td><td>4</td></tr>
</table></td><td>
<table>
<tr><td>Set the radicand ≥ 0</td><td>$x\geq 0$</td></tr>
<tr><td>Solve the inequality (already done)</td><td>$x\geq 0$</td></tr>
<tr><td>Write in desired form</td><td>$[0,\infty)$</td></tr>
</table></td></tr>
<tr><td> 
</td><td></td></tr>
<tr><td>The domain seems to start at 0 and t values from the table show that 0 is possible. The graph only shows part of the
entire graph – x continues to any number
greater than 16</td><td></td></tr>
<tr><td>Thus $x\geq 0$ or $[0,\infty)$. The range is the possible values of y, also $[0,\infty)$.</td><td></td></tr>
</table>

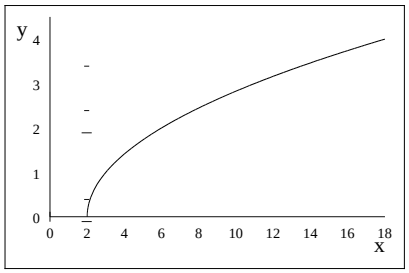
Example 2 Find the domain of $f(x)=\sqrt{x-2}$. Write the answer in interval notation.

Solution Since the index is understood to be 2, it is even.

Graphically find the domain (and range)

Make a table of values

x	$\sqrt{x-2}$
2	0
3	1
6	2
11	3
18	4



The domain seems to start at 2 and the values from the table show $x=2$ is possible. The graph only shows part of the entire graph – x may take any value greater than 18.

Thus $x\geq 2$ or $[2,\infty)$. The range from the graph is all possible values of y, $[0,\infty)$

Algebraically find the domain

Set the radicand ≥ 0	$x-2\geq 0$
Solve the inequality	
(add 2 to both sides)	$x\geq 2$
Write in desired form	$[2,\infty)$

If we did the same process for $f(x)=\sqrt{x-2}+3$, domain would be the same but the range would be $[3,\infty)$.

These examples had inequalities that were fairly easy to solve. If we are unable to solve the inequality, graphing should be used. One reason for covering this type of problem now is that we can solve some more complicated equations as in the next example.

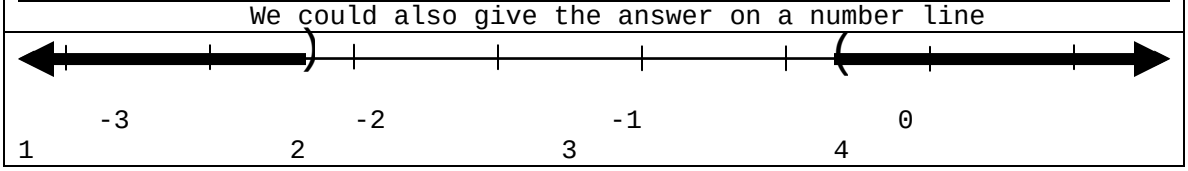
Example 3 Find the domain of $f(x)=\sqrt{x^2-x-3}$.

Solution The index is understood to be 2 and so is even.

Algebraically find the domain

Set the radicand ≥ 0	$x^2-x-3\geq 0$
Solve the inequality	
Find the boundary values from equality	$x^2-x-3=0$
(Not all quadratics factor,use quadratic formula.)	$x=\dfrac{-(-1)\pm\sqrt{(-1)^2-4(1)(-3)}}{2(1)}$
	$x=\begin{cases}\dfrac{1-\sqrt{13}}{2}\approx -1.303\\ \dfrac{1+\sqrt{13}}{2}\approx 2.303\end{cases}$
Test each interval formed.	$\left(-\infty,\dfrac{1-\sqrt{13}}{2}\right)$: $x^2-x-3\geq 0$ TRUE $\left(\dfrac{1-\sqrt{13}}{2},\dfrac{1+\sqrt{13}}{2}\right)$: $x^2-x-3\geq 0$ FALSE $\left(\dfrac{1+\sqrt{13}}{2},\infty\right)$: $x^2-x-3\geq 0$ TRUE
Since can also be equal,	$\dfrac{1\pm\sqrt{13}}{2}$ is included in the solution.
Solution in interval notation	$\left(-\infty,\dfrac{1-\sqrt{13}}{2}\right]\cup\left[\dfrac{1+\sqrt{13}}{2},\infty\right)$

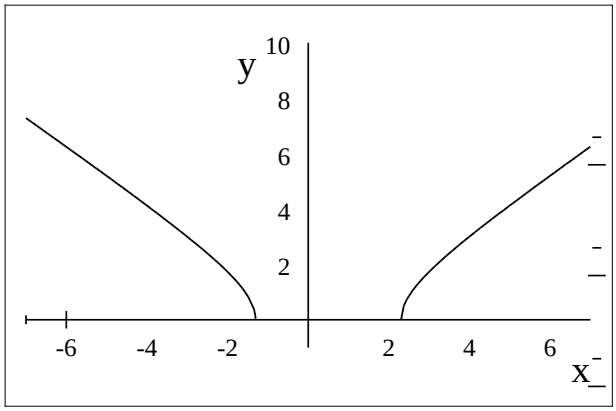
We could also give the answer on a number line



As with the number line, a graph is only approximate. Sometimes this is the best that can be done. On the next page, we see the graphical solution. Notice that the answer is a good approximation. Approximations may be all that is really needed.

Graphically find the domain (and range)

x	$\sqrt{x^2-x-3}$
-2	1.7
-1.5	0.866
2.5	0.866
4	3
6	5.196



From the graph, we can only get approximate values for x. To the left, it looks like $x \le -1.3$ and to the right it looks like $x \ge 2.3$. Thus in interval notation, the domain is $(-\infty, -1.3] \cup [2.3, \infty)$. The range is $y \ge 0$.

Example 4 Find the domain of $f(x) = \sqrt[3]{x-2}$.

Solution Since the index is odd (3), the domain is all real numbers.

Exercises

Find the domain of the following:

1. $f(x) = \sqrt{3x-5}$
2. $f(x) = \sqrt{2x+7}$
3. $g(t) = \sqrt{7t}$
4. $g(t) = \sqrt{\frac{2}{5}t}$
5. $f(x) = \sqrt[3]{x-7}$
6. $f(x) = \sqrt[3]{4x}$
7. $f(x) = \sqrt{\frac{3}{7}x+2}$
8. $f(x) = \sqrt{\frac{2}{9}x-4}$
9. $g(x) = 4 - \sqrt{1.2x-5}$
10. $g(x) = \sqrt{4.3x+2} - 7$
11. $f(x) = \sqrt[3]{3x^2+5x-2}$
12. $f(x) = \sqrt[3]{4x^2-4x+1}$
13. $f(x) = \sqrt{6x^2-4x-2}$
14. $f(x) = \sqrt{x^2-3x-9}$
15. $f(x) = \sqrt{2x^2-4x-9}$
16. $f(x) = \sqrt{x^2-5x-10}$
17. $f(x) = \sqrt{2x^2-12x-18}$
18. $f(x) = \sqrt{3x^2+12x+12}$
19. $g(t) = \sqrt{t^2-8t+20}$
20. $g(z) = \sqrt{2z^2+5z+8}$
21. $f(x) = \sqrt{5x-10-x^2}$
22. $f(x) = \sqrt{x-2-4x^2}$

ANSWERS

1. $\left[\frac{5}{3},\infty\right)$ 2. $\left[-\frac{7}{2},\infty\right)$ 3. $[0,\infty)$ 4. $[0,\infty)$

5. $(-\infty,\infty)$ 6. $(-\infty,\infty)$ 7. $\left[-\frac{14}{3},\infty\right)$ 8. $[18,\infty)$

9. $[4.167,\infty)$ 10. $(-0.465,\infty)$ 11. $(-\infty,\infty)$ 12. $(-\infty,\infty)$

13. $\left(-\infty,-\frac{1}{3}\right]\cup[1,\infty)$ 14. $\left(-\infty,\frac{3-3\sqrt{5}}{2}\right]\cup\left[\frac{3+3\sqrt{5}}{2},\infty\right)$

15. $\left(-\infty,\frac{2-\sqrt{22}}{2}\right]\cup\left[\frac{2+\sqrt{22}}{2},\infty\right)$ 16. $\left(-\infty,\frac{5-\sqrt{65}}{2}\right]\cup\left[\frac{5+\sqrt{65}}{2},\infty\right)$

17. 18. $(-\infty,\infty)$ 19. $(-\infty,\infty)$ 20. $(-\infty,\infty)$

21. No real number 22. No real number