**MTH 132**

**Precalculus with Science Applications**

**Spring 2014**

**Text and calculator**

College Algebra and Trigonometry by Ron Larson 9/e

TI-84 or equivalent

**Computer requirements**

You need to have access to the University’s computers, which you should if you are a registered student. We will go to the 5th floor lab at least once to familiarize you with a program called Mathematica.

**Instructor**

Dr. Clayton Brooks

Office: Smith Hall 723

Office hours: M-F 12:00 – 1:00, or by appointment

E-mail: brooksc at marshall.edu

Telephone: The University does not give me full telephone access so I may not be able to return your call. So, with that in mind, my number is ×6-6702.

**Course description**

MTH 132 - Precalculus with Science Applications. 5 hrs.

Functions used in calculus including polynomial, rational, exponential, logarithmic, and trigonometric. Systems of equations and inequalities, conic sections, polar, parametric equations, sequences and series. Binomial Theorem. (PR: Math ACT 24 or above, or *C* or better in MTH 127or *C* or better in MTH 130)

**Learner outcomes**

The student is expected to be able to:

* Define and evaluate functions.
* Interpret tabular and graphical representations of functions.
* Determine the domain and range of a function by its graph.
* Draw graphs of functions.
* Determine intercepts and use the Vertical Line Test.
* Define and graph a linear function.
* Find the slope of a line.
* Find the equation of a line.
* Find equations of parallel and perpendicular lines.
* Find a linear function that models an application.
* Examine situations involving direct and inverse variation.
* Algebraically and graphically find points of intersection of two lines.
* Algebraically and graphically solve a linear inequality.
* Use the distance and midpoint formulas.
* Create and use the standard form of the equation of a circle.
* Find arithmetic and composite combinations of functions.
* Graph algebraic transformations of known graphs.
* Determine if a function is odd or even.
* Determine intervals of increase of a function, and its average rate of change.
* Solve equations and inequalities involving absolute values.
* Evaluate and graph a piecewise-defined function.
* Find the vertex and axis of symmetry of a quadratic function.
* Identify the max/min of a quadratic function and its application.
* Solve a quadratic equation by factoring or using the quadratic formula.
* Perform arithmetic with complex numbers.
* Interpret, solve, and apply quadratic inequalities algebraically and graphically.
* Solve equations of a quadratic form.
* Determine zeros and end behavior of polynomial functions.
* Determine the multiplicity of a zero of a polynomial function.
* Perform long division of polynomials.
* Apply the Factor Theorem and the Rational Zero Test.
* Understand the statement and consequences of the Fundamental Theorem of Algebra.
* Examine all asymptotes of a rational function.
* Solve polynomial and rational inequalities.
* Find the inverse of a function.
* Sketch the graph of an exponential function.
* Identify and apply the natural exponential function.
* Understand the relationship between exponential and logarithmic functions.
* Graph and apply logarithmic functions.
* Define and apply basic properties of logarithms.
* Solve exponential and logarithmic equations and their applications.
* Model exponential, logarithmic, and logistic growth.
* Know and convert radian and degree measure of angles.
* Compute angular and linear speed.
* Define trigonometric functions using triangles and the unit circle.
* Determine exact trigonometric values of special angles.
* Solve problems with a right triangle relationship.
* Sketch and analyze the graphs of the basic trigonometric functions.
* Know the properties and graphs of the inverse trigonometric functions.
* Be able to evaluate certain inverse trigonometric expressions.
* Know basic trigonometric identities.
* Apply strategies for verifying identities.
* Know and apply the sum identity for sine and cosine.
* Know the double angle and power reducing identities.
* Solve basic trigonometric equations.
* Approximate solutions to higher level trigonometric equations.
* Solve problems using the Law of Sines and Law of Cosines.
* Find the area of a triangle using Heron’s Formula.
* Graph points in the polar coordinate system.
* Convert to and from polar and rectangular coordinates.
* Perform basic arithmetic on vectors, graphically and algebraically.
* Use vectors for problem solving applications.
* Find the dot product of vectors.
* Use the dot product to determine angles and projections.
* Understand the nature of solutions to linear systems.
* Use substitution and elimination to solve linear systems.
* Model problems with linear systems.
* Use matrices to represent linear systems.
* Utilize technology to solve linear systems.
* Perform matrix arithmetic and its relation to applications.
* Find the inverse of a matrix.
* Calculate the determinant of a matrix.
* Compute the partial fraction decomposition of a rational expression.
* Be familiar with the basic forms of the equations of conic sections.
* Define and identify arithmetic and geometric sequences.
* Compute the terms of sequences.
* Apply sequences to problems.
* Understand and work with summation notation.
* Find the sum of terms of arithmetic and geometric series.
* Generate the terms, the partial sum, and find a rule of a general sequence.
* Become familiar with the use of an appropriate graphing calculator.
* Use the basic functions of Mathematica.

**Assessment of learner outcomes**

The student will be expected to:

* Answer questions that determine basic comprehension of concepts.
* Interpret results given data or graphs.
* Simplify expressions.
* Solve equations.
* Graph results or functions.
* Interpret results.
* Apply concepts to find solutions to a situation.

This will be demonstrated by the results of 4 in-class tests and a cumulative final exam.

The test will consist of a portion that does not allow a calculator or other technology, and a portion that will require a graphing calculator.

No sharing of calculators or other technology during a test is allowed.

**Grading policy**

The weights given to aspects of the class are:

60% In-class tests

35% Final exam

5% Mathematica sheet and other assignments

A letter grade, or its equivalent on a 90-80-70-60 scale, will be given for each aspect. The final grade will be based on the weighted average.

**Late penalties**

A penalty of 1% reduction for each hour late will be assessed for any assignment. Make-up tests will not be given for any unexcused absence.

**Attendance policy**

There is no formal attendance policy. However, being absent for exams and class presentations and discussions inherently carries potentially severe penalties.

**Course philosophy**

The basic idea is to provide the student with the algebraic and trigonometric tools needed to succeed in learning calculus. Poor pre-calculus skills are the largest factor in a student failing in calculus. Breadth, rather than depth, of the wide range of subjects will dictate the schedule for the semester.

**A Personal Note:**

This academic year has been a difficult one for me. My parents started last year in their home. Since then, one has died and the other one has been placed in a nursing home, unlikely to improve much. I apologize in advance if I don’t perform up to my full potential, or if I leave suddenly to take care of personal matters. Hopefully, you won’t experience this, and that next year will be better.

**Teaching outline**

Week of:

January 13: Review over Chapters P and 1.1 – 1.3

January 21: Review 1.4 – 1.7

January 27: Sections 1.8 – 2.4

February 3: Sections 2.5 – 2.7 **Test on February 7**

February 10: Sections 3.1 – 3.5

February 17: Sections 4.1 – 5.2

February 24: Sections 5.3 – 5.5 **Test on February 28**

March 3: Sections 6.1 – 6.5

March 10: Sections 6.6 – 7.3

March 24: Sections 7.4 – 7.5 **Test on March 13**

March 31: Sections 8.1 – 8.5

April 7: Sections 9.1 – 9.4

April 14: Sections 9.5 – 10.4

April 21: Section 10.5, **Test on April 23,** Sections 11.1 – 11.2

April 28: Sections 11.3, 11.5, Mathematica lab, final review.

**The Final Exam is on Monday, May 5, 10:15 – 12:15**