

Course Outline – MAT 160 – 2018-2019

<b><u>COURSE TITLE:</u></b>	Precalculus (MAT 160)																		
<b><u>DEPARTMENT:</u></b>	STEM (Science, Technology, Engineering & Mathematics)																		
<b><u>INSTRUCTOR:</u></b>	Raymond M Leduc Jr <b><u>OFFICE:</u></b> 845-236-5810 <b><u>EMAIL:</u></b> raymond.leduc@marlboroschools.org																		
<b><u>OFFICE HOURS:</u></b>	By Appointment																		
<b><u>TEXTBOOK:</u></b>	Precalculus with Limits, Third Edition, Larson, Hostetler, Edwards, Houghton Mifflin ISBN:0-618-05291-7																		
<b><u>OBJECTIVE:</u></b>	To provide the student with the necessary background in: algebra, trigonometry and analytic trigonometry & geometry, so student will be prepared to continue on to Calculus I. Upon successful completion of MAT 160 (with a C or better) the student may enroll in MAT 170 – Calculus I.																		
<b><u>COURSE CONTENT:</u></b>	This course covers the following chapters & sections:  <table><tr><td>Chapter 1: Functions and Their Graphs</td><td>Sections: 1.1 – 1.5</td></tr><tr><td>Chapter 2: Polynomial and Rational Functions</td><td>Sections: 2.1 – 2.7</td></tr><tr><td>Chapter 3: Exponential and Logarithmic Functions</td><td>Sections: 3.1 – 3.5</td></tr><tr><td>Chapter 4: Trigonometric Functions</td><td>Sections: 4.1 – 4.8</td></tr><tr><td>Chapter 5: Analytic Trigonometry</td><td>Sections: 5.1 – 5.5</td></tr><tr><td>Chapter 6: Additional Topics in Trigonometry</td><td>Sections: 6.1 – 6.2</td></tr><tr><td>Chapter 7: System of Equations</td><td>Sections: 7.1 – 7.3</td></tr><tr><td>Chapter 8: Matrices and Determinants</td><td>Sections: 8.1 – 8.5</td></tr><tr><td>Chapter 12: Limits and Intro to Calculus</td><td>Sections: 12.1–12.4</td></tr></table> Other sections may be included if time permits.	Chapter 1: Functions and Their Graphs	Sections: 1.1 – 1.5	Chapter 2: Polynomial and Rational Functions	Sections: 2.1 – 2.7	Chapter 3: Exponential and Logarithmic Functions	Sections: 3.1 – 3.5	Chapter 4: Trigonometric Functions	Sections: 4.1 – 4.8	Chapter 5: Analytic Trigonometry	Sections: 5.1 – 5.5	Chapter 6: Additional Topics in Trigonometry	Sections: 6.1 – 6.2	Chapter 7: System of Equations	Sections: 7.1 – 7.3	Chapter 8: Matrices and Determinants	Sections: 8.1 – 8.5	Chapter 12: Limits and Intro to Calculus	Sections: 12.1–12.4
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## STUDENT LEARNING

### OUTCOMES:

1. Demonstrate comprehension of fundamental concepts associated with functions such as computing, evaluating, graphing and/or stating domain & range of functions and their inverses.
2. Analyze and graph Polynomial and Rational functions such as stating domain & range, calculating intercepts, equations of asymptotes and/ or evaluating infinite and 1-sided limits.
3. Analyze Exponential and Logarithmic functions
4. Analyze and solve various trigonometric problems such as interpreting the graphs of trigonometric functions, solving trigonometric equations, verifying trigonometric identities and/ or solving a problem using either sum, difference, half-angle or double-angle formulas

## SPECIFIC COURSE

### OBJECTIVES:

1. Find the domain and range of a function algebraically and graphically.
2. Evaluate the difference quotient for various functions such as a quadratic or rational function.
3. Sketch graphs of basic functions by the method of translation.
4. Evaluate a function for different values of  $x$  or  $y$ .
5. Find the local maximum and/or local minimum of a function.
6. Find a linear function and interpret the meaning of slope,  $x$  and  $y$  intercepts.
7. Find a quadratic function given the vertex and one point.
8. Set up a function and maximize or minimize the function.
9. Find and simplify composition of functions.
10. Determine if two functions are inverses using the definition.
11. Find the inverse function of linear, quadratic, cubic, and rational functions.
12. Sketch the graph of a polynomial function using the method of factoring along with polynomial behavior.
13. Divide polynomials using the long division algorithm and synthetic division
14. Solve a polynomial equation of degree three or higher.
15. Find a polynomial function given the degree, intercepts and one point.
16. Analyze a rational function:
  - a. Find horizontal and vertical asymptotes,
  - b. Find  $x$  and  $y$  intercepts, if any,
  - c. Sketch the graph.
17. Sketch the graph of an exponential function by method of translation and show the  $x$  and  $y$  intercepts if any and the horizontal asymptote.
18. Find the inverse function of an exponential function.
19. Find the domain and range of exponential and logarithmic functions.
20. Use the definition to evaluate logarithms without a calculator.
21. Solve an exponential equation two ways
  - a. By taking the log of both sides
  - b. By equating the bases on both sides
22. Use properties of logarithms to
  - a. Expand an expression into sums and differences
  - b. Write an expression as a single logarithm
  - c. Evaluate expressions without a calculator
23. Solve logarithmic equations and express the answer in exact form and as a decimal approximation.

24. Apply the growth/decay formula in a word problem
  - a. Use given information to find the growth or decay constant,  $k$
  - b. Set up the model and use the model to answer question about the population
25. Graph a translated ellipse and give:
  - a. center
  - b. vertices
  - c. foci
  - d. length of major and minor axes
  - e. eccentricity
26. Graph a hyperbola and give:
  - a. foci
  - b. vertices
  - c. equations of the asymptotes
27. Complete a right triangle using the Pythagorean Theorem and find the values of the six trigonometric functions of one of the angles of the triangle using the definition of the trig functions.
28. Know the exact values of the trigonometric functions for  $30^\circ$ ,  $45^\circ$ , and  $60^\circ$  and the quadrantal angles.
29. Evaluate trigonometric functions of special angles without a calculator
30. Use a calculator to evaluate trigonometric values of angles.
31. Simplify trigonometric expressions using identities and/or algebra.
32. Solve right triangle word problems.
33. Verify trigonometric identities using the fundamental identities-Pythagorean, reciprocal, tangent, and cotangent.
34. Solve trigonometric equations.
35. Sketch the graph of the inverse sine, cosine, and tangent functions
36. Given an angle, find multiple co-terminal angles.
37. Convert from degrees to radians and radians to degrees.
38. Find the exact values of the six trigonometric functions for a general angle using reference triangles or the unit circle.
39. Find the values of the six trigonometric functions for an angle  $t$  with given conditions on the unit circle including the quadrantal angles.
40. Use the formulas for negatives to rewrite trigonometric expressions.
41. Graph the sine, cosine, and tangent functions with changes in amplitude, period, and vertical shifts.
42. Given a unit circle labeled in radians, find the value of a trigonometric function of a given radian value or find the radian measure of an angle given the value of a trigonometric function.
43. Find the reference angle for any given angle.
44. Use reference angles to compute the exact/approximate value of a trigonometric function of any given angle.
45. Using a calculator, find the trigonometric function of any given angle or given the value of a trigonometric function, find the measure of the angle on a given interval.
46. Given a sine or cosine function, find the amplitude, period, and phase shift and sketch the curve.
47. Given the graph of a sine or cosine function or the amplitude, period and phase shift, write a sine or cosine function.
48. Given a tangent function, find the period and phase shift and sketch the curve showing the vertical asymptotes.
49. Write a specified part of a right triangle in terms of two other specified parts.

50. Solve application problems involving right triangles using the trigonometric functions.
51. Solve trigonometric equations over the set of real numbers or on a given interval.
52. Rewrite trigonometric expressions as a cofunction of a complementary angle.
53. Use an addition or subtraction formula to evaluate or simplify an expression.
54. Use an addition or subtraction formula to verify an identity or rewrite an expression.
55. Use a double-angle formula to evaluate or simplify an expression.
56. Use a double-angle formula to verify an identity or rewrite an expression.
57. Use a double-angle formula to solve a trigonometric equation on a given interval.
58. Evaluate expressions involving the inverse trig functions.
59. Solve trigonometric equations on a given interval.
60. Solve application problems using the inverse trigonometric functions.
61. Use the Law of Sines to solve triangles.
62. Solve applications using the Law of Sines.
63. Use the Law of Cosines to solve triangles.
64. Solve applications using the Law of Cosines.
65. Solve 2x2 systems by substitution and elimination methods.
66. Solve a 3x3 system of linear equations using elimination and back substitution.
67. Use partial fraction decomposition methods to rewrite a fraction as the sum of two fractions. (if time permits)
68. Given parametric equations, write an x/y equation by eliminating the parameter and sketch the curve. (if time permits)
69. Convert from rectangular to polar coordinates or polar coordinates to rectangular coordinates. (if time permits)
70. Convert a polar equation to a rectangular equation or a rectangular equation to a polar equation. (if time permits)
71. Sketch the graph of a polar equation. (if time permits)

**TESTING, FINAL EXAM &  
GRADING POLICY:**

Your course grade will be determined as follows:

Final exam: 20%

4 or 5 unit exams: 60%

Quizzes: 15%

Attendance & participation: 5%

The Department Grade Scale is as follows:

A 93-100	C 73-76
A- 90-92	C- 70-72
B+ 87-89	D+ 67-69
B 83-86	D 63-66
B- 80-82	D- 60-62
C+ 77-79	F 0-59

**ATTENDANCE POLICY:**

Attendance is a requirement of this course and will be used in determining your course grade.

**WITHDRAWAL POLICY:**

Students wishing to withdraw from a course must secure the necessary withdrawal form from the Registrar's Office. The withdrawal must be processed promptly by the student by immediately notifying their advisor, and the Registrar's Office.

A student may officially withdraw from a course through the first two thirds of the time period of that course and will receive a grade of W. **A student may withdraw during the last third of the course only for verified special circumstances, such as death in the family, hospitalization, transfer from area, or prolonged illness.** In these cases, information must be submitted by the instructor through the office of the Vice President for Academic Affairs, on a form available in the Registrar's or Vice President's Offices. Supporting documentation must accompany special circumstances withdrawals.

**ACADEMIC HONESTY:**

Academic honesty means that students are expected to do their own work and follow the rules regarding acts such as cheating and plagiarism. It is the student's responsibility to maintain academic honesty. That is, ignorance of the standards of academic honesty is not an acceptable excuse for breaking these standards

Academic dishonesty - breaking the standards of academic honesty - is taken very seriously by the College. Breaking the rules of academic honesty will result in immediate disciplinary consequences.