JOLIET JUNIOR COLLEGE 1901
DEPARTMENT OF MATHEMATICS

Math 142
Accelerated Trigonometry/Pre-calculus

Course Description
This is an accelerated course that completes the objectives for both MATH 138 and MATH 139 in one semester. This is a fast-paced course intended only for highly motivated students.

Illinois Articulation Initiative (IAI) number: N/A

Credit and Contact Hours:

Lecture	**5**
Lab	**0**
Credit Hours	**5**

Prerequisites: Appropriate placement score or minimum grade "C" in MATH 095 and MATH 098 or equivalent. An "A" in MATH 098 is recommended.

Books, Supplies, and Supplementary Materials

A. **Required Textbooks**

MyMathLab Direct Digital Access. The eText is included in MyMathLab so if you are comfortable reading the textbook on the computer, you may use the eText alone. **There is no need to purchase a physical textbook for this course; the direct digital access fee for the eText was included in your course fees. Registration instructions are posted in our iCampus/Canvas site.**

B. **Other Required Materials**

TI-83/TI-84 graphing calculator

C. **Methods of Instruction:**

Lecture, Hybrid, or Online

General Education Student Learning Outcome

1. Quantitative Literacy: Students possess the ability to reason and solve quantitative problems from an array of contexts.

Course Learning Outcomes (CLOs)

1. Explore characteristics of functions.
2. Graph functions from the various function families.
3. Analyze equations and inequalities in problem-solving situation.
4. Analyze and apply characteristics of conics.
5. Analyze basic properties of arithmetic and geometric sequences and geometric
6. Find exact and approximate trigonometric function values of angles
7. Graph the 6 trigonometric functions with a variety of transformations
8. Find exact and approximate inverse trigonometric function values
9. Manipulate trigonometric identities

10. Solve trigonometric equations
11. Solve right and oblique triangles
12. Graph vectors, polar equations, and parametric equations

Lesson Learning Outcomes (LLOs)

1. Define a linear function and give properties of the graph.
2. Find the Average Rate of Change of a linear function.
3. Find the zeroes of a linear function.
4. Solve applications that use linear functions
5. Define a quadratic function and give properties of the graph.
6. Graph a quadratic function with and without a graphing calculator.
7. Find the zeroes of a quadratic function with and without a graphing calculator.
8. Solve applications that use quadratic functions.
9. Find the maximum and minimum of a quadratic function.
10. Solve inequalities involving quadratic functions.
11. Define a polynomial function and give properties of the graph.
12. Define a power function and give properties of the graph.
13. Identify the zeroes of a polynomial function and their multiplicity.
14. Describe the end behavior of a polynomial function.
15. Analyze the graph of a polynomial function.
16. Solve polynomial inequalities.
17. Find the real zeroes of a polynomial function using the remainder and factor theorems, Descartes' rule of signs, and the rational zeroes theorem.
18. State the Intermediate Value Theorem and use it to show the existence of a zero of a function on a given interval.
19. Define a complex polynomial function.
20. Give the Fundamental Theorem of Algebra.
21. Use the conjugate pairs theorem to find the complex zeroes of a polynomial function.
22. Find the complex zeroes of a polynomial function.
23. Define a rational function.
24. Determine the domain of a given rational function.
25. Give the properties of the graph of a rational function.
26. Analyze the graph of a rational function.
27. Determine the equations of the asymptotes for the graph of a rational function.
28. Solve rational inequalities.
29. Find a composite function and the domain of a composite function.
30. Define a one-to-one function.
31. Determine whether a function is one-to-one or not.
32. Define an inverse function.
33. Find the inverse function of a given one-to-one function.
34. Define an exponential function and give the properties of the graph.
35. Define the number e.
36. Define an exponential function with base e and give the properties of the graph.
37. Solve exponential equations.
38. Solve applications that use exponential expressions such as interest formulas, law of uninhibited growth or decay formula, Newton's law of cooling and logistic functions.
39. Define a logarithmic function and give the properties of the graph.
40. Define a logarithmic function with base e and give the properties of the graph.
41. Know and use the properties of logarithms to rewrite logarithmic expressions.
42. Write a logarithmic expression as a sum or difference of logarithms.
43. Write a logarithmic expression as a single logarithm.
44. Know and use the change of base formula when necessary to solve a problem.
45. Solve logarithmic equations.
46. Define an angle and explain when angles are positive and negative.
47. Explain when an angle is in standard position and draw angles using degree and radian measure.

48. Convert between angle measurements in degree, minutes, seconds and decimal degrees.
49. Convert between angle measurements in radians between radian measure and degree.
50. Determine arc length and the area of a sector.
51. Find the linear speed of an object traveling in a circular motion.
52. Define the six basic trigonometric functions using the unit circle and a circle of radius r
53. Determine the domain, range, and period of the trigonometric functions.
54. Determine the sign of each trigonometric function in each of the four quadrants.
55. Find the trigonometric functions of an angle using its reference angle.
56. Use the fundamental identities to find the exact values of the 6 trigonometric functions of an angle.
57. Determine which of the trigonometric functions are even and which are odd.
58. Draw one cycle of the graphs for the six basic trigonometric functions giving the properties of the graph.
59. State the amplitude, period, and phase shift of trigonometric functions.
60. Graph equations of the form $y = a\sin(bx + c)$, $y = a\cos(bx + c)$, $y = a\tan(bx + c)$, $y = a\csc(bx + c)$, $y = a\sec(bx + c)$, $y = a\cot(bx + c)$, using the graph transformations.
61. Given a sinusoidal graph, find its equation.
62. Define the inverse sine, cosine and tangent functions giving the domain and range.
63. Find the exact and approximate values of the inverse sine, cosine and tangent functions.
64. Find the exact and approximate values of expressions involving the inverse sine, cosine and tangent functions.
65. Evaluate exact and approximate values of the inverse secant, cosecant and cotangent functions.
66. Explain what is meant by an identity equation.
67. Use algebra and the fundamental identities to establish an identity.
68. Establish an identity involving inverse trigonometric functions.
69. Use the sum and difference formulas to find exact values and establish identities
70. Use the double-angle and half-angle formulas to find exact values and establish identities
71. Express products as sums and sums as products using the approximate trigonometric formulas.
72. Solve equations involving a single trigonometric function.
73. Solve trigonometric equations that have quadratic form.
74. Solve trigonometric equations using identities.
75. Solve trigonometric equations linear in sine and cosine.
76. Define the six basic trigonometric functions using right triangles.
77. Define and use the complementary angle theorem.
78. Solve right triangles.
79. Solve oblique triangles using the Law of Sines and the Law of Cosines.
80. Find the area of any triangle using the triangle area formulas.
81. Analyze simple harmonic motion and damped motion. (optional, if time permits)
82. Plot points using polar coordinates.
83. Find several polar coordinate ordered pairs for a single point.
84. Convert between polar coordinates and rectangular coordinates.
85. Convert between polar equations and rectangular equations.
86. Graph and identify polar equations
87. Test polar equations for symmetry (optional, if time permits)
88. Define the complex plane and demonstrate how to graph complex numbers on the complex plane.
89. Define the magnitude and argument of the complex number.
90. Convert the algebraic form of a complex number to polar form and vice-versa.
91. Find the product and quotient of two complex numbers in polar form.
92. Find the nth power of complex numbers using DeMoivre's Theorem.
93. Find the nth complex roots of a complex number.
94. Define a vector and its magnitude and direction.
95. Add and subtract vectors and find scalar multiples of a vector.
96. State and use the properties for vector addition, scalar multiplication and the equality of vectors.
97. Write the algebraic vector v with the vector components.

98. Find the position vector for any vector.
99. Determine the unit vector u in the same direction as a given vector.
100. Write a vector from its direction and magnitude.
101. Determine the dot product of two vectors and state and use the properties of the dot product.
102. Determine the angle between two vectors.
103. Determine whether two vectors are orthogonal or parallel.
104. Define the conic sections: Circle, Parabola, Ellipse, and Hyperbola
105. Find an equation for a conic section given foci, vertices, asymptotes, etc. (graphically or numerically presented).
106. Given an equation of a conic section determine foci, vertices, asymptotes, and eccentricity as appropriate.
107. Graph the conic section.
108. Find terms of a sequence, including those defined recursively. Use appropriate notation.
109. Recognize when a sequence is arithmetic or geometric.
110. Find terms and finite sums of arithmetic and geometric sequences.
111. Graph parametric equations
112. Find a rectangular equation for a curve defined parametrically
113. Use time as a parameter in parametric equations
114. Find parametric equations for curves defined by rectangular equations
115. Binomial Theorem and Induction (optional)
116. Use mathematical induction to prove statements about sums of sequences and about divisibility.
117. Expand powers of binomials using the Binomial Theorem.

Final Course Grading Scale

Grade	Percentage
A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	lower than 60%

Faculty Commitment

Faculty members are committed to providing a quality learning experience through thoughtful planning, implementation, and assessment of course activities. They are also committed to being readily available to students throughout the semester by returning e-mails and phone calls within 48 hours and to returning graded course work within a week. Furthermore, they are committed to selecting appropriate course materials and making them available in an organized and timely manner.

Student Commitment

For every credit hour a student is enrolled in, they should expect to spend at least 2 hours outside of class studying, working on assignments, and preparing for class each week of the fifteen-week semester. For example, for this five credit-hour class, students can expect to spend five hours per week in class actively engaged in learning the material by participating in face-to-face classes or viewing lectures and instructional material online. In addition, students should expect to spend another ten hours per week outside of class completing homework and assignments, posting to discussion boards online, or studying for quizzes and tests. This means students should spend a minimum of 15 hours per week engaged in achieving the learning outcomes for this course. If you are not achieving your desired results in this class, you should consider increasing your prep time outside of class, in addition to using available resources such as instructor office hours and tutoring services.

By registering for this course, you commit yourself to active participation in course activities as well as the submission of all assignments and exams on time. Furthermore, you commit to accessing the course site and checking your JJC e-mail several times a week.