

HIBBING COMMUNITY COLLEGE COURSE OUTLINE

COURSE NUMBER & TITLE: MATH 1040 - College Algebra

CREDITS: 4 (4 Lec/ 0 Lab)

PREREQUISITES: MATH 1020: Advanced Algebra with a grade of "C" or better, or Placement Test

CATALOG DESCRIPTION:

College Algebra topics include fundamentals of algebra, graphs, functions, equations, inequalities, polynomial and rational functions, exponential and logarithmic functions, systems of equations and matrices, conic sections, and the binomial theorem. MNTC goal areas: (4)Math/Logical Reasoning.

OUTLINE OF MAJOR CONTENT AREAS:

- I. Basic concepts of algebra
 - A. The real-number system
 - B. Integer exponents, scientific notation, and order of operations
 - C. Addition, subtraction, and multiplication of polynomials
 - D. Factoring
 - E. Rational expressions
 - F. Radical notation and rational exponents
- II. Graphs, functions, and models
 - A. Introduction to graphing
 - B. Functions and graphs
 - C. Linear functions, slope, the point-slope equation, and applications
 - D. Equations of lines and modeling
 - E. More on functions
 1. Increasing, decreasing, and constant functions
 2. relative maximum and minimum values
 3. piecewise defined functions
 - F. The algebra of functions
 - G. Symmetry and transformations
- III. Functions, equations, and inequalities
 - A. Linear equations, functions, and models
 - B. The complex numbers
 - C. Quadratic equations, functions, and models
 - D. Analyzing graphs of quadratic functions
 - E. More equation solving
 1. rational equations
 2. radical equations

- 3. equations with absolute value
 - F. Solving linear inequalities
- IV. Polynomial and rational functions
 - A. Polynomial functions and modeling
 - B. Polynomial division
 - C. The remainder and factor theorems
 - D. Theorems about zeros of polynomial functions
 - E. Rational functions
 - F. Polynomial and rational inequalities
 - G. Variation and applications
- V. Exponential and logarithmic functions
 - A. Composite and inverse functions
 - B. Exponential functions and graphs
 - C. Logarithmic functions and graphs
 - D. Properties of logarithmic functions
 - E. Solving exponential and logarithmic equations
 - F. Growth and decay
- VI. Systems of equations and matrices
 - A. Systems of equations in two variables
 - B. Systems of equations in three variables
 - C. Matrices and systems of equations
 - D. Matrix operations
 - E. Inverses of matrices
 - F. Partial fractions
- VII. Conic sections
 - A. The parabola
 - B. The circle and ellipse
 - C. The hyperbola
 - D. Non linear systems of equations
- VIII. The binomial theorem
- IX. Curve fitting and regression

COURSE GOALS/OBJECTIVES/OUTCOMES:

Students will

1. identify various kinds of real numbers.
2. use interval notation to write a set of numbers.
3. identify the properties of real numbers.
4. find the absolute value of a real number.
5. simplify expressions with integer exponents.
6. solve problems using scientific notation.
7. use the rules for order of operations.
8. identify the terms, coefficients, and degree of a polynomial.
9. add, subtract, and multiply polynomials.
10. factor polynomials by removing a common factor.
11. factor polynomials by grouping.

12. factor polynomials of the type $x^2 + bx + c$.
13. factor trinomials of the type $ax^2 + bx + c$ where a is not 1 using the FOIL method and the grouping method.
14. factor special products of polynomials.
15. determine the domain of a rational expression.
16. simplify rational expressions.
17. multiply, divide, add, and subtract rational expressions.
18. simplify complex rational expressions.
19. simplify radical expressions.
20. rationalize denominators or numerators in rational expressions.
21. convert between exponential and radical notation.
22. simplify expressions with rational exponents.
23. plot points.
24. determine whether an ordered pair is a solution of an equation.
25. graph equations.
26. find the distance between two points in the plane and find the midpoint of a segment.
27. find an equation of a circle with a given center and radius, and given an equation of a circle, find the center and the radius.
28. graph equations of circles.
29. determine whether a correspondence or a relation is a function.
30. find function values, or outputs, using a formula.
31. find the domain and the range of a function.
32. determine whether a graph is that of a function.
33. solve applied problems using functions.
34. determine the slope of a line given two points on the line.
35. solve applied problems involving slope and linear functions.
36. graph linear functions and equations, finding the slope and the y-intercept.
37. determine equations of lines with the point-slope equation.
38. given the equations of two lines, determine whether their graphs are parallel, perpendicular, or neither.
39. graph functions, looking for intervals on which the function is increasing, decreasing, or constant, and estimate relative maxima and minima.
40. given an application, find a function formula that models the application; find the domain of the function and function values, and then graph the function.
41. graph functions define piecewise.
42. find the sum, the difference, the product, and the quotient of two functions, and determine the domains of the resulting functions.
43. find the composition of two functions and the domain of the composition; decompose a function as a composition of two functions.
44. determine whether a graph is symmetric with respect to the x-axis, the y-axis, and the origin.
45. determine whether a function is even, odd, or neither even nor odd.
46. given the graph of a function, graph its transformation under translations, reflections, stretchings, and shrinkings.

47. solve linear equations.
48. solve applied problems using linear models.
49. find zeros of linear functions.
50. solve a formula for a given variable.
51. perform computations involving complex numbers.
52. find zeros of quadratic functions and solve quadratic equations by using the principle of zero products, by using the principle of square roots, by completing the square, and by using the quadratic formula.
53. solve equations that are reducible to quadratic.
54. find the vertex, the line of symmetry, and the maximum or minimum value of a quadratic function using the method of completing the square.
55. graph quadratic functions.
56. solve applied problems involving maximum and minimum function values.
57. solve rational and radical equations and equations with absolute value.
58. solve linear inequalities, using interval notation to express solution sets.
59. solve compound inequalities.
60. solve inequalities with absolute value.
61. determine the behavior of the graph of a polynomial function using the leading-term test.
62. factor polynomial functions and find the zeros and their multiplicities.
63. graph polynomial functions.
64. use the intermediate value theorem to determine whether a function has a real zero between two given real numbers.
65. perform long division with polynomials and determine whether one polynomial is a factor of another.
66. use synthetic division to divide a polynomial by $x - c$.
67. use the remainder theorem to find a function value $f(c)$.
68. use the factor theorem to determine whether $x - c$ is a factor of $f(x)$.
69. find a polynomial with specified zeros.
70. for a polynomial function with integer coefficients, find the rational zeros and the other zeros, if possible.
71. use Descartes' rule of signs to find information about the number of real zeros of a polynomial function with real coefficients.
72. graph a rational function, identifying all asymptotes.
73. solve applied problems involving rational functions.
74. solve polynomial and rational inequalities.
75. find equations of direct, inverse, and combined variation given values of the variables.
76. determine whether a function is one-to-one, and if it is, find a formula for its inverse.
77. graph exponential equations and functions.
78. solve applied problems involving exponential functions and their graphs.
79. graph logarithmic functions.
80. convert between exponential and logarithmic equations.
81. find common and natural logarithms using a calculator.

82. convert from logarithms of products, powers, and quotients to expressions in terms of individual logarithms, and conversely.
83. simplify expressions of the type $\log_a a^x$ and $a^{\log_a x}$.
84. solve exponential and logarithmic equations.
85. solve applied problems involving exponential growth and decay.
86. solve a system of two linear equations in two variables by graphing.
87. solve a system of two linear equations in two variables using the substitution and the elimination methods.
88. solve systems of linear equations in three variables.
89. solve systems of equations using matrices.
90. add, subtract, and multiply matrices when possible.
91. write a matrix equation equivalent to a system of equations.
92. find the inverse of a square matrix, if it exists.
93. use inverses of matrices to solve systems of equations.
94. decompose rational expressions into partial fractions.
95. given an equation of a parabola, complete the square, if necessary, and then find the vertex, the focus, and the directrix and graph the parabola.
96. given an equation of a circle, complete the square, if necessary, and then find the center and the radius and graph the circle.
97. given an equation of an ellipse, complete the square, if necessary, and then find the center, the vertices, and the foci and graph the ellipse.
98. given an equation of a hyperbola, complete the square, if necessary, and then find the center, the vertices, and the foci and graph the hyperbola.
99. solve a nonlinear system of equations.
100. use the binomial theorem to expand a power of a binomial.

MNTC GOALS AND COMPETENCIES MET:

Mathematical/Logical Reasoning a, b, c, and d

HCC COMPETENCIES MET:

Communicating Clearly & Effectively

Thinking Creatively & Critically

STUDENT CONTRIBUTIONS:

The student will attend class regularly, participate in class discussion, complete daily assignments, in class exercises, exams, and a comprehensive final examination. The student will spend a minimum of two hours completing assignments for every hour in class. These must be accomplished in such a way that they meet minimum standards set by the instructor.

STUDENT ASSESSMENT SHALL TAKE PLACE USING INSTRUMENTS SELECTED /DEVELOPED BY THE COURSE INSTRUCTOR.

SPECIAL INFORMATION: (SPECIAL FEES, DIRECTIVES ON HAZARDOUS MATERIALS):

The student may be required to provide a calculator for this course. If a specific calculator model is required, this model will be specified by the instructor on the course syllabus. Examples of calculators which may be required include but are not limited to the following: the TI89 and the TI Voyage 200.

AASC APPROVAL: January 18, 2012

REVIEW DATE: January 2017

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