



CURRICULUM CATALOG

Pre-calculus

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Pre-calculus Course Overview

Pre-calculus is a full-year, high school credit course that is intended for the student who has successfully mastered the core algebraic and conceptual geometric concepts covered in the prerequisite courses: Algebra I, Geometry, and Algebra II. The course primarily focuses on the skills and methods of analytic geometry and trigonometry while investigating further relationships in functions, probability, number theory, limits, and the introduction of derivatives.

- **Relations and Functions:** Student will examine functions, inverses of functions and combine functions to verify inverses, as well as distinguish between linear and quadratic functions.
- **Functions:** Student will solve polynomials using the quadratic theorem, remainder theorem and factor theorem, identify graphs of different polynomial equations and inequalities, and understand complex numbers.
- **Trigonometric Functions:** Student will identify and solve for missing components of trigonometric functions, calculating trigonometric values for different angles and relate degrees to radians, and radians to degrees.
- **Circular Functions and their Graphs:** Student will use parametric equations with trigonometric operations to model and solve problems, and calculate amplitude, period, and phase shift for graphed trigonometric functions.
- **Identities and Functions of Multiple Angles:** Student will simplify trigonometric expressions utilizing trigonometric identities, and double and half-angle formulas, and combine the identities and angle formulas learned in this unit to prove trigonometric relationships.
- **Application of Trigonometric Functions:** Student will solve problems using trigonometric functions and combine trigonometric functions and vectors to solve incline plane problems and navigation problems.
- **Inverse Trigonometric Functions and Polar Coordinates:** Student will solve for unknowns using inverse trigonometric functions, recognize their graphs, and convert equations from Cartesian to polar coordinates, and from polar to Cartesian coordinates.
- **Quadratic Equations:** Student will identify properties and equations of circles, ellipses, parabolas and hyperbolas, and calculate point rotations and apply them to equations.
- **Counting Principles:** Student will distinguish between mutually exclusive, independent and dependent events, and between combination and permutation, and use the explicit formula and the recursive formula to find the n th term as well as the general term of an arithmetic sequence, or geometric sequence.
- **Calculus:** Student will solve functions involving numbers and conditions, understand limit notation, and evaluate limits using the limit theorems, and find the slope of curves, and calculate the angle between two curves

| Unit 1: Relations and Functions | | |
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| Assignments | | |
| Pre-calculus | 1. Course Overview | 8. Algebra of Functions: Composition |
| | 2. Ordered-Pair Numbers: Relations | 9. Algebra of Functions: Inverse |
| | 3. Ordered-Pair Numbers: Functions | 10. Quiz 2: Relations and Functions |
| | 4. Ordered-Pair Numbers: Rules of Correspondence | 11. Special Project* |
| | 5. Quiz 1: Relations and Functions | 12. Test |
| | 6. Algebra of Functions: Notation | 13. Alternate Test* |
| | 7. Algebra of Functions: Arithmetic | 14. Glossary and Credits |

| Unit 2: Functions | | |
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| Assignments | | |
| Pre-calculus | 1. Linear Functions: Graphs | 14. Conjugates and Polynomial Identities |
| | 2. Linear Functions: Equations | 15. Distance and Midpoint |
| | 3. Quiz 1: Linear Functions | 16. Quiz 4: Complex Numbers |
| | 4. 2nd-Degree Functions: Solutions | 17. Rational Inequalities |
| | 5. Relationships Between Zeros and Coefficients | 18. Greatest Integer Function |
| | 6. Quadratic Inequalities | 19. Exponential Function |
| | 7. Quiz 2: Second-Degree Functions | 20. Logarithmic Function |
| | 8. Polynomial Functions | 21. Function Combinations |
| | 9. Nth-Degree Equations | 22. Quiz 5: Special Functions |
| | 10. Solving Polynomial Equations | 23. Special Project* |
| | 11. Quiz 3: Polynomial Functions | 24. Test |
| | 12. Complex Numbers | 25. Alternate Test* |
| | 13. Operations with Complex Numbers | 26. Glossary and Credits |

| Unit 3: Trigonometric Functions | | |
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| Assignments | | |
| Pre-calculus | 1. Definition of the Trigonometric Functions | 10. Quiz 5: Quadrantal Angles |
| | 2. Quiz 1: Trigonometric Functions | 11. Special Angles |
| | 3. Evaluation of Functions | 12. Quiz 6: Special Angles |
| | 4. Quiz 2: Evaluation of Functions | 13. Radian Measure |
| | 5. Angle Location | 14. Quiz 7: Radian Measure |
| | 6. Quiz 3: Angle Location | 15. Special Project* |
| | 7. Reduction Formulas | 16. Test |
| | 8. Quiz 4: Reduction Formulas | 17. Alternate Test* |
| | 9. Quadrantal Angles | 18. Glossary and Credits |

| Unit 4: Circular Functions and Their Graphs | | |
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| Assignments | | |
| Pre-calculus | 1. Circular Functions | 12. Amplitude of Circular Functions |
| | 2. Quiz 1: Circular Functions | 13. Quiz 6: Amplitude of Circular Functions |
| | 3. Circular Functions of Special Angles | 14. Period of Circular Functions |
| | 4. Quiz 2: Circular Functions of Special Angles | 15. Quiz 7: Period of Circular Functions |
| | 5. Graphs of Sin and Cos | 16. Phase Shift of Circular Functions |
| | 6. Quiz 3: Graphs of Sin and Cos | 17. Quiz 8: Phase Shift of Circular Functions |
| | 7. Other Graphs | 18. Special Project* |
| | 8. Quiz 4: Other Graphs | 19. Test |
| | 9. Applications | 20. Alternate Test* |
| | 10. Parametric Equations | 21. Glossary and Credits |
| | 11. Quiz 5: Applications | |

| Unit 5: Identities and Functions of Multiple Angles | | |
|---|---|--|
| Assignments | | |
| Pre-calculus | 1. Reciprocal Relations | 12. Quiz 6: Additional Sum and Difference Formulas |
| | 2. Quiz 1: Reciprocal Relations | 13. Double- and Half-Angle Formulas |
| | 3. Pythagorean Relations | 14. Quiz 7: Double- and Half-Angle Formulas |
| | 4. Quiz 2: Pythagorean Relations | 15. Identities |
| | 5. Quotient Relations | 16. Quiz 8: Identities |
| | 6. Quiz 3: Quotient Relations | 17. Trigonometric Equations |
| | 7. Trigonometric Identities | 18. Quiz 9: Trigonometric Equations |
| | 8. Quiz 4: Trigonometric Identities | 19. Special Project* |
| | 9. Cosine of the Sum of Two Angles | 20. Test |
| | 10. Quiz 5: Cosine of the Sum of Two Angles | 21. Alternate Test* |
| | 11. Additional Sum and Difference Formulas | 22. Glossary and Credits |

| Unit 6: Semester Review and Exam | | |
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| Assignments | | |
| Pre-calculus | 1. Review | 3. Alternate Exam—Form A* |
| | 2. Exam | 4. Alternate Exam—Form B* |

| Unit 7: Application of Trigonometric Functions | | |
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| Assignments | | |
| Pre-calculus | 1. Trigonometric Functions of Any Angle | 12. Applications of Vectors |
| | 2. Quiz 1: Trigonometric Functions of Any Angle | 13. More Applications |
| | 3. More Trigonometric Functions of Any Angle | 14. Quiz 5: More Applications |
| | 4. Quiz 2: Trigonometric Functions | 15. Inclined Plane Application |
| | 5. Applied Problems | 16. Navigation Application |
| | 6. Law of Cosines | 17. Quiz 6: Additional Application Problems |
| | 7. Quiz 3: Law of Cosines | 18. Special Project* |
| | 8. Law of Sines | 19. Test |
| | 9. Quiz 4: Law of Sines | 20. Alternate Test* |
| | 10. Vectors | 21. Glossary and Credits |
| | 11. Operations with Vectors | |

Unit 8: Inverse Trigonometric Functions and Polar Coordinates

Assignments

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|--------------|-----|--------------------------------------|-----|---|
| Pre-calculus | 1. | The Inverse Sine Function | 15. | Converting Cartesian Equations to Polar Equations |
| | 2. | Quiz 1: The Inverse Sine Function | 16. | Quiz 8: Converting Cartesian Equations to Polar Equations |
| | 3. | The Inverse Cosine Function | 17. | Converting Polar Equations to Cartesian Equations |
| | 4. | Quiz 2: The Inverse Cosine Function | 18. | Quiz 9: Converting Polar Equations to Cartesian Equations |
| | 5. | The Inverse Tangent Function | 19. | Graphing Polar Equations |
| | 6. | Quiz 3: The Inverse Tangent Function | 20. | Quiz 10: Graphing Polar Equations |
| | 7. | Other Inverse Functions | 21. | Project: De Moivre's Theorem |
| | 8. | Quiz 4: Other Inverse Functions | 22. | Special Project* |
| | 9. | Graphs of Inverse Functions | 23. | Test |
| | 10. | Quiz 5: Graphs of Inverse Functions | 24. | Alternate Test* |
| | 11. | Graphing Polar Coordinates | 25. | Glossary and Credits |
| | 12. | Quiz 6: Graphing Polar Coordinates | | |
| | 13. | Converting Coordinates | | |
| | 14. | Quiz 7: Converting Coordinates | | |

Unit 9: Quadratic Equations

Assignments

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|--------------|-----|------------------------------------|-----|-----------------------------|
| Pre-calculus | 1. | The Circle | 13. | The Parabola Applied |
| | 2. | The Circle Continued | 14. | The Hyperbola |
| | 3. | Equation from Three Points | 15. | Quiz 2: Quadratic Equations |
| | 4. | Equation from Three Points Applied | 16. | Translation |
| | 5. | The Ellipse | 17. | Translation of Equations |
| | 6. | The Ellipse: Standard Form | 18. | Rotation |
| | 7. | The Ellipse: General Form | 19. | Rotation of Equations |
| | 8. | The Ellipse Applied | 20. | Quiz 3: Quadratic Equations |
| | 9. | Quiz 1: Quadratic Equations | 21. | Special Project* |
| | 10. | The Parabola | 22. | Test |
| | 11. | The Parabola Continued | 23. | Alternate Test* |
| | 12. | The Parabola: Standard Form | 24. | Glossary and Credits |

Unit 10: Counting Principles

Assignments

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|--------------|-----|---|-----|------------------------------------|
| Pre-calculus | 1. | Definitions, Sample Spaces, and Probability | 11. | Quiz 2: Probability |
| | 2. | Addition of Probabilities | 12. | Arithmetic and Geometric Sequences |
| | 3. | Multiplication of Probabilities | 13. | Summation |
| | 4. | Quiz 1: Probability | 14. | Arithmetic and Geometric Series |
| | 5. | Definitions | 15. | Quiz 3: Sequences and Series |
| | 6. | Permutation of N Things: Different | 16. | Proofs by Mathematical Induction |
| | 7. | Permutation of N Things: Not All Different | 17. | Special Project |
| | 8. | Circular Permutations | 18. | Test |
| | 9. | Combinations | 19. | Alternate Test |
| | 10. | Binomial Theorem | 20. | Glossary and Credits |

| Unit 11: Calculus and Review | | |
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| Assignments | | |
| Pre-calculus | 1. Functional Notation | 11. Review: Identities, Multiple Angle Functions |
| | 2. Difference Quotient | 12. Review: Inverse Trig Functions; Polar Coordinates; Quadratics |
| | 3. Limits | 13. Review: Probability and Calculus |
| | 4. Quiz 1: Limits | 14. Quiz 3: Reviews |
| | 5. Slope of a Curve | 15. Special Project |
| | 6. Slope of a Line | 16. Test |
| | 7. Angle Between Curves | 17. Alternate Test |
| | 8. Quiz 2: Slopes and Curves | 18. Glossary and Credits |
| | 9. Review: Relations and Functions | |
| | 10. Review: Trigonometric and Circular Functions | |

| Unit 12: Semester Review and Exam | | |
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| Assignments | | |
| Pre-calculus | 1. Review | 3. Alternate Exam—Form A* |
| | 2. Exam | 4. Alternate Exam—Form B* |

| Unit 13: Final Exam | | |
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| Assignments | | |
| Pre-calculus | 1. Exam | 3. Alternate Exam—Form B* |
| | 2. Alternate Exam—Form A* | |

(*) Indicates alternative assignment