Marshall University

College of Science

Mathematics Department

MTH 122: Plane Trigonometry

Course catalog description

A study of the trigonometric functions, graphs of the trigonometric functions, identities, equations, inverse trigonometric functions, vectors, complex numbers, and applications.

Credit hours

3 hours

Prerequisites

ACT Math 22 or SAT Math 520, or a grade of C or higher in MTH127 or MTH130

List of topics

1. **Right-Triangle Trigonometry**:
   - Angles & measurements (degrees, minutes seconds, decimal degrees).
   - Arithmetic of angle measures.
   - Similar triangles and ratios of sides of right-triangles.
   - Exact values compared to decimal approximations.
   - Accuracy of approximations.
   - Optional: measurements and rules of rounding values to the appropriate number of significant digits.
2. **Circular Trigonometric Functions:**
   - The unit circle with angles measured in radians.
   - Angles in standard position and trig ratios involving x, y and distance, r, from the origin.
   - Reference angles.
   - Arc length and central angle;

- linear and angular velocity.

3. **Graphing Trigonometric Functions:**
    - Amplitudes, periods and translations of sines and cosines.
    - Periods, asymptotes and graphs of tangent, cotangent, secant and cosecant.

4. **Trigonometric Identities:**
    - Identities distinguished from conditional equations.
    - Appropriate methods and procedures for verifying identities.
    - Pythagorean, angle-sum, double-angle, half-angle, product-to-sum and sum-to-product identities.

5. **Solving Trigonometric Equations:**
    - Inverse-trig functions.
    - Solving equations which have one or more trig and/or inverse-trig functions.
    - Exact-value solutions versus approximations.

6. **Trigonometric Applications:**
    - Law of sines (including ambiguity) and law of cosines. Solving oblique triangles from appropriate partial information. Optional: solution check using Mollweide's formula.
    - Vectors, operations, and dot product, including physical problems. Solutions will involve oblique triangles.
    - Complex numbers, polar coordinates and polar form. Products, quotients, powers, roots and DeMoivre's Theorem. Optional: notations exp(i theta) and/or cis(theta).

Learner Outcomes

- Understand, and use effectively, all six trig functions, defined both by right triangles and also by the unit circle.
- Graph each of the six trig functions on its extended domain, and know the features of each function.
- Verify trig identities using proper mathematical techniques.
- Solve conditional equations which involve trig and/or inverse-trig functions.
- Given a side and two other values, find all possible triangles, if any.
- Understand vectors and polar-form complex numbers so that physics problems can be solved and so that products, quotients, powers and roots can be computed easily.

Suggested textbooks

Dugopolski, *Trigonometry*, 4th edition. ISBN 978-0-32-191552-8

Young, *Trigonometry*, 3rd edition. ISBN 978-0-47-064802-5

Lial, Hornsby, Schneider, *Trigonometry*, 6th edition. ISBN 978-0-13-411252-7

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