

Fall 2022

## Math 140 – Precalculus: Trigonometry and Analytic Geometry (3)

Studies trigonometric functions, analytic geometry, polar coordinates, and related topics. This course is the second part of the precalculus sequence. Credit allowed for at most one of 134, 135, or 140.

Pre: 134, 135 or 161 or assessment exam.

**Text:** John “Curlee” Robertson, *Tools for Calculus* (Latest Edition).

**Format:** This three credit class meets for 100 minutes of lecture and 100 minutes of recitation per week. The recitation sections will be taught by TAs. A good portion of the recitation section should be spent on student work, such as on worksheets. Faculty need to meet with their TAs before the semester begins to discuss course organization and policies; faculty should continue to communicate with TAs on at least a weekly basis to ensure they are covering the correct material. This course will satisfy students FQ requirement. All instructors of the course must agree to meet the appropriate Foundations Hallmarks, which can be found at <https://manoa.hawaii.edu/gened/req/foundations/>.

### Approximate timeline:

**a. Fundamentals (2 hours)**

Interval notation, completing the square, quadratic formula, solving inequalities, absolute value inequalities.

**b. Functions (3 hours)**

Function, domain, range, graph, sums, products and quotients of functions, composites of functions and inverse functions. Transformations.

**c. Polynomial and Rational Functions (4 hours)**

Polynomial functions, rational functions, graphing, intercepts, asymptotes, and changes in sign.

**d. Exponential and Logarithmic Functions (3 hours)**

The function  $y = b^x$ ,  $b > 0$ , the number  $e$ , the function  $y = e^x$ , the inverse of  $y = b^x$  is the function  $y = \log_b x$ , the function  $y = \ln x$ , the properties of logarithms and the change of base formula.

**e. Trigonometric Functions of Real Numbers (3 hours)**

The trigonometric functions of real numbers, Pythagorean identities, opposite angle identities, period, amplitude, the graphs of  $y = \sin x$  and  $y = \cos x$ , the graphs of  $y = A \sin(Bx \pm C)$  and  $y = A \cos(Bx \pm C)$ , and the graph of  $y = \tan x$ .

**f. Trigonometric functions of angles (4 hours)**

Degree and radian measure, formula for arc length, angular and linear speed, trigonometric functions of angles in standard position, evaluating trigonometric functions, reference angles, basic identities and right angle trigonometry, Law of Sines, Law of Cosines.

**g. Analytical Trigonometry (4 hours)**

Addition formulas for sine, cosine and tangent, double angle formulas, half-angle formulas, product-to-sum and sum-to-product formulas, trigonometric equations and inverse trigonometric functions.

**h. Polar coordinates (1 hour)**

Polar coordinates.

**i. Analytical Geometry (3 hours)**

The definitions of the ellipse and the hyperbola. Students can identify the equations of and graph parabolas, ellipses, and hyperbolas with axes parallel to the  $x$  and  $y$  axes.

**Course Objectives and Student Learning Outcomes.** Upon successful completion of Math 140, the student will be able to work with, apply, and answer questions pertaining to the material in the list of topics at the level of a standard “Precalculus” text.

**Program Objectives.** The successful student will acquire the skills prerequisite to “Calculus”.