

MATH1060: Final Exam Study Guide

The following is an overview of the material that will be covered on the third exam.

§4.1 Radian and Degree Measure

- Converting between radians and degrees.
- Computing lengths of arcs of circles.
- Computing the area of a sector.

§4.2 Trigonometric Functions

- Definitions of the six fundamental trigonometric functions.
- Values of the fundamental trig functions on the unit circle.
- Know the unit circle.
- Seriously, know the unit circle.
- The period of sine, cosine, and tangent.
- Know which trig functions are even/odd.

§4.3 Right Angle Trigonometry

- Common Pythagorean triples, e.g. $(3, 4, 5)$, $(5, 12, 13)$, $(8, 15, 17)$, $(7, 24, 25)$.
- Evaluating trig functions for acute angles in a right triangle (SOHCAHTOA).
- The reciprocal, quotient, and Pythagorean identities.
- Know the Pythagorean identity: $\sin^2 \theta + \cos^2 \theta = 1$.
- Simplifying expressions using identities.
- Applications involving right triangles.

§4.4 Trigonometric Functions of Any Angle

- Evaluate trig functions for a central angle in a circle of any radius.
- Evaluate trig functions using identities.
- Finding θ when given $\sin \theta$ (or some other trig function evaluated at θ) and the quadrant in which θ lies.
- Finding an angle when given the value of two trig functions.

§4.5 Graphs of Sine and Cosine Functions

- Graph functions of the form $f(x) = a \cdot \sin(b(x - c)) + d$.
- Know how the constants a , b , c , and d affect the function.

§4.6 Graphs of Other Trigonometric Functions

- Graphs $\tan x$, $\cot x$, $\sec x$, $\csc x$, and variations thereof.
- The period, domain, and range of the above functions.

§4.7 Inverse Trigonometric Functions

- The definition of \sin^{-1} , \cos^{-1} , and \tan^{-1} .
- Computing values of \arcsin , \arccos , and \arctan for standard angles.
- Graphing inverse trig functions.

§4.1 Angular and Linear Velocity

- The definition of linear and angular velocity.
- The relationship between the two (i.e., $v = r\omega$).
- Solving problems with linear/angular velocity.

§4.8 Applications and Models

- Using the standard trigonometric functions (and their inverses) to solve a right triangle.
- Using the standard trigonometric functions (and their inverses) to find directions in terms of bearings.
- Using the standard trigonometric functions (and their inverses) to solve harmonic motion problems.
- Using the standard trigonometric functions (and their inverses) to solve other word problems.

§5.1 Using Fundamental Identities

- Using fundamental identities to evaluate a function.
- Using fundamental identities to simplify an expression.
- Factoring trigonometric expressions.
- Rewriting expressions using a common denominator.
- Rewriting expressions without fractions.
- Using trigonometric substitution to simplify an expression.
- Rewriting a logarithmic expression.

§5.2 Verifying Trigonometric Identities

- Be able to verify trig expressions/identities.

§5.3 Solving Trigonometric Equations

- Finding solutions to trig equations in the interval $[0, 2\pi)$.
- Finding all the solutions to a given trig equation.
- Using any of the following techniques to solve trig equations:
 - Collecting like terms
 - Extracting square roots
 - Factoring
 - Rewriting with a single trigonometric function

- Squaring and converting to quadratic type
- Solving trig equations involving multiple angles.
- Using inverse trig functions.

§5.4 Sum and Difference Formulas

- Evaluating a trig function using sum/difference formulas.
- Solving trig equations using sum/difference formulas.
- Proving a cofunction identity.

§5.5 Multiple-Angle and Product-to-Sum Formulas

- Solving a trig equation involving multiple angles.
- Evaluating a trig expression using multiple-angle or product-to-sum formulas.
- Deriving a triple angle formula.
- Reducing powers in a trig expression.
- Using sum-to-product and product-to-sum formulas.

§6.1 Law of Sines

- Solving a triangle using the law of sines (AAS or ASA).
- Solving a triangle using the law of sines given SSA. This is the ambiguous case where there can be either 0, 1, or 2 triangles satisfying the given conditions. Know how to tell which is the case and be able to find all the possible solutions.
- Finding the area of an oblique triangle ($A = \frac{1}{2}bc \sin \alpha$).

§6.2 Law of Cosines

- Solving a triangle using the law of cosines (SSS or SAS).
- Using Heron's Formula to find the area of a triangle.

§6.3 Vectors in the Plane

- Finding the component form of a vector, given initial and terminal points.
- Finding the magnitude of a vector, given its component form.
- Adding vectors and scalar multiplication.
- Finding a unit vector that points in the direction of a given vector.
- Writing a vector as a linear combination of the standard unit vectors.
- The remainder of §6.3 (i.e., page 424-426) will not be covered on the exam.

§6.4 Vectors and Dot Products

- Computing the dot product of two vectors.
- Determining whether or not two vectors are orthogonal.
- Finding the angle between two vectors.

- Finding a vector orthogonal to a given vector.
- Computing $\text{proj}_{\vec{v}} \vec{u}$.
- Decomposing a vector, \vec{u} , into $\vec{u} = \vec{w}_1 + \vec{w}_2$ where \vec{w}_1 and \vec{w}_2 are orthogonal and \vec{w}_1 is a scalar multiple of a given vector, \vec{v} .

§6.5 Trigonometric Form of a Complex Number

- Computing the modulus and argument of a complex number.
- Converting a complex number in standard form to trig form and vice versa.
- Multiplying and dividing complex numbers (either in trig form or standard form).
- Using DeMoivre's Theorem to raise a complex number to a power.
- Finding all n -th roots of a complex number.

§10.7 Polar Coordinates

- Converting between rectangular and polar coordinates.
- Finding multiple representations of a point in polar coordinates.
- Converting equations from rectangular to polar coordinates and vice versa.