

## Course Number and Title: MAT 193 Reasoning with Functions II

**Campus Location:**

Georgetown, Dover, Stanton, Wilmington

**Effective Date:**

2022-52

**Prerequisite:**

MAT 183

**Co-Requisites:**

None

**Course Credits and Hours:**

4.00 credits

4.00 lecture hours/week

0.00 lab hours/week

**Course Description:**

Reasoning with Functions II is designed for students who have completed Reasoning with Functions I, and plan on taking calculus courses or coursework requiring a thorough understanding of functions and algebraic reasoning. It provides the opportunity to use multiple representations and explicit covariational reasoning to investigate and explore quantities, their relationships, and how these relationships change. Students use their knowledge of functions to model and solve problems involving algebraic and transcendental functions and equations. Students also develop algebraic tools necessary to model and solve problems using trigonometric functions and their properties.

**Required Text(s):**

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

**Additional Materials:**

Graphing Calculator

**Schedule Type:**

Classroom Course

Video Conferencing

Web Conferencing

Hybrid Course

Online Course

Hyflex

**Disclaimer:**

None

**Core Course Performance Objectives (CCPOs):**

1. Apply geometric reasoning to model and solve problems involving length, area, and volume. (CCC 2,6)
2. Model and solve meaningful problems using trigonometric functions and their properties. (CCC 2,6)
3. Use trigonometric identities and formulas to solve meaningful problems. (CCC 2,6)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

**Measurable Performance Objectives (MPOs):**

Upon completion of this course, the student will:

1. Apply geometric reasoning to model and solve problems involving length, area, and volume.
  1. Approximate area under a graph of a function using rectangles.
  2. Use technology to optimize the area and perimeter of rectangular regions.
  3. Determine how much to reduce the height of a triangle in order to create a new triangle with desired area.
  4. Determine the distance between two points in a plane using the Pythagorean Theorem.
  5. Determine the relationships between the rates of change among the sides of a dynamically changing right triangle.
  6. Use the Pythagorean Theorem to estimate the length of a curve.
  7. Use distance measures to determine average velocities.
  8. Determine the average rate of change of the circumference and area of a circle and volume of a disk as a function of the average rate of change of the radius.
  9. Use the relationship between volume and radius of a sphere to determine the relationship between their rates of change.
  10. Compute the distance between two numbers on the number line as represented by absolute value.
  11. Solve equations and inequalities involving absolute value and interpret intervals using absolute value.
  12. Determine equations of circles given a point, P, and positive distance r or given two points in the plane.
  13. Use similar triangles to model static relationships and dynamic relationships.
  14. Set up and solve geometric optimization problems.
  15. Calculate speed of an object in uniform circular motion.
  16. Use proportional reasoning to find arc lengths and areas of circular sectors.
  17. Determine the radian measure of the central angle of a given circular sector.
  18. Calculate surface area and volume of cylinders, cones, and frustums.
2. Model and solve meaningful problems using trigonometric functions and their properties.
  1. Analyze sinusoidal models.
  2. Construct sinusoids from circles.
  3. Compute values of the sine and cosine functions using the unit circle.
  4. Evaluate the graph of trigonometric functions using a graphing calculator or app, using radians appropriately.
  5. Interpret formulas for sinusoidal functions in the context of a model.
  6. Locate special angles on the unit circle and give them in degrees and radians.
  7. Locate and interpret the special points of a sinusoidal function on a graph and in context.
  8. Model a physical situation using non-unit circles to include graphing sine and cosine functions.
  9. Determine how changes in angles and radius affect the location of points on a non-unit circle.
  10. Model real-world applications such as damped harmonic motion, the motion of a pendulum, cell phone signals, or vibrations of cell phones.
  11. Transform sinusoidal functions horizontally and vertically.
  12. Describe the rate of change of sine and apply the rate of change of sine.
  13. Apply right triangle trigonometry to find side lengths.
  14. Apply inverse trigonometric functions to real-world situations.
  15. Solve trigonometric equations.
  16. Model and interpret functions to include the tangent, inverse tangent, secant, inverse secant, cotangent, inverse cotangent, cosecant, and inverse cosecant.
  17. Apply periodic functions to situations such as car wheels, or AM radio signals.
3. Solve meaningful problems using trigonometric identities and formulas.
  1. Use the Pythagorean Identity to prove identities, find trigonometric values, and to rewrite trigonometric expressions in equivalent forms.
  2. Apply the angle sum identities for sine and cosine to real-world situations such as guitar harmonics.
  3. Use a sum-to-product identity to rewrite and analyze the sum of two sine functions.
  4. Use the double-angle formula and half-angle formula in such scenarios as projectile motion, Malus' Law, planetary motion, or circular motion.
  5. Use the laws of sines and cosines to find missing angles and sides.

**Evaluation Criteria/Policies:**

The grade will be determined using the Delaware Tech grading system:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
0	-	69	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

**Final Course Grade:**

Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Summative: Exams – 4 Unit tests and final (Equally Weighted)	65%
Formative	35%
TOTAL	100%

**Core Curriculum Competencies (CCCs are the competencies every graduate will develop):**

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

**Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):**

None

**Disabilities Support Statement:**

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.