

Functions and Modeling (MATH 2325)

Meeting Times: 2:30-3:25 pm MWF in RBN 3040

Last day to withdraw: Monday, November 4, 2024

Instructor: Nathan Smith

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Office Hours: Tentatively 1:25-2:20 MW, 9:05-10:00 F, with other times available by appointment.

Text: None required

Course Topics: Functions (linear, exponential, quadratic), modeling, parametric and polar coordinates, vectors, complex numbers, all with an eye toward the middle and secondary classroom. It is expected that not all of the mathematics we will study in this class will be “new” to you, but the perspective from which it is approached may well be. You will engage in problem solving and inquiry based learning. Particular emphasis will be given to connections among University level mathematics topics and to connections between University level mathematics and the middle and secondary curricula.

In addition, part of what we are doing in this course is modeling a discovery learning classroom environment. Most of us come through our school experiences with little exposure to this type of learning, and many of you will be expected to at least partially implement this type of learning environment in your classrooms. Part of the point of this class is for you to have the experience of a discovery learning mathematics class.

Student Learning Outcomes: By the end of the course students should be able to:

1. demonstrate a depth of content knowledge with regard to important secondary mathematics topics such as linear, exponential, logarithmic, and quadratic functions, parametric relations, polar relations, vectors, and complex numbers.
2. generate or work with relevant lab or exploration data and use regression, function pattern, and systems methods to produce a model of the data.
3. present mathematical ideas and topics in a knowledgeable and effective manner.
4. identify mathematics content connections between the various levels of secondary mathematics curriculum and between secondary and university level curriculum.

Grading:

- Test1: $\frac{1}{4}$ of your semester grade (late September-ish);

- Test2: $\frac{1}{4}$ of your semester grade (late November-ish);
- Final: $\frac{1}{4}$ of your semester grade (according to university schedule);
- Written work (Class assignments, HW, Quizzes, etc.): $\frac{1}{4}$ of your semester grade.

Missed work: It is not expected that you will miss a test. If an emergency situation or university-sanctioned event forces your absence on the day of the test and if you have discussed the situation in advance with the instructor, your final exam grade will be used to replace your test. Because much of the learning in this class revolves around discovery learning activities undertaken during the class time attendance is extremely important. I am not responsible enough to handle late work (getting it on the same pile as other papers from the same assignment, grading it, recording the grade, etc.).

Artificial Intelligence: UT Tyler is committed to exploring and using artificial intelligence (AI) tools as appropriate for the discipline and task undertaken. We encourage discussing AI tools' ethical, societal, philosophical, and disciplinary implications. All uses of AI should be acknowledged as this aligns with our commitment to honor and integrity, as noted in UT Tyler's Honor Code. Faculty and students must not use protected information, data, or copyrighted materials when using any AI tool. Additionally, users should be aware that AI tools rely on predictive models to generate content that may appear correct but is sometimes shown to be incomplete, inaccurate, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the quality and content of the information you submit. Misusing AI tools that violate the guidelines specified for this course (see below) is considered a breach of academic integrity. The student will be subject to disciplinary actions as outlined in UT Tyler's Academic Integrity Policy.

For this course, you may not use AI tools to produce anything turned in for a grade.

Student Academic Conduct: It is your responsibility to learn the material in this course for your own benefit. You should not let this discourage you from working together on your homework but in the end what you turn in should reflect your understanding, not just be copied from someone else. *During the tests and the final exam, a code of honor will apply under which students are to work alone and neither give help to others nor receive help from any sources.* Students are also expected to help enforce this code. Students are encouraged to obtain a copy of *A Student Guide to Conduct and Discipline at UT Tyler*, available in the Office of Student Affairs.

University Policies: For University policies concerning Students' Rights and Responsibilities, Grade Replacement/Forgiveness, State-Mandated Course Drop Policy, Disability Services, Student Absence due to Religious Observance, Student Absence for University-Sponsored Events and Activities, and the Social Security and FERPA Statement please see: <http://www.uttyler.edu/academicaffairs/files/syllabuspolicy.pdf>.

Course outline

- Proportional and linear Situations
 - Field of Vision activity
 - Six cats six rats six minutes
 - cups (m-b)
 - proportional triangles and slope, using table, differences
 - integral points problem
 - m-b plane
 - regression
- Exponential functions,
 - exponential growth/decay, add-add becomes add-multiply
 - “differential equations” activity
- Quadratics
 - Fun with parabolas
 - Fun with conics
 - More fun with parabolas
 - Falling spheres
- Sequences
 - sequences
 - double sequences and differences – add-add, multiply-multiply, etc.
 - charts, differences, fitting function to sequence
- Systems
 - Stamp problem,
 - “charts”
 - systems and vectors,