Math 112 Instructor Syllabus   Winter, Spring 2016

Text: *Functions, Trigonometry, and their Applications*, by Dan Raies.

Technology: If you require a graphing calculator, **use it** and recommend a TI-84, TI-83 Plus or TI-83. If you do not allow the use of a calculator, be prepared to a) not use one yourself (lest ye be accused of hypocrisy) and b) write exams so that the simplification of arithmetically complex problems does not overshadow the actual concept they are being tested on.
If you're open to it, free and/or browser-based programs like Wolfram|Alpha can be of tremendous use to you and to students.

Course Goals: A student successfully completing the course should, in a general sense, have…
- ✓ the tools necessary to succeed in a trigonometry-based calculus course or discrete mathematics,
- ✓ facility modeling the mathematical topics described among the learning outcomes in words, then solve or simplify the relevant equations and/or expressions, and finally write a summary statement of the solution. <u>In short, all of the learning outcomes should be incorporated with skill at mathematical modeling.</u>

Learning Outcomes: A successful student can…
- ✓ identify, by formula, verbal description, or graph the vertical and horizontal transformations that take a parent function to an indicated function
- ✓ identify a function as periodic from its definition,
- ✓ describe characteristics of periodic functions such as period, as well as amplitude and midline where applicable,
- ✓ describe the sine, cosine, and tangent functions from both unit circle and right triangle perspectives,
- ✓ describe the characteristics of the sine, cosine, and tangent as functions,
- ✓ calculate all angles and side lengths of both right and oblique triangles, given appropriate information,
- ✓ compute using both degrees and radians as measures of angles,
- ✓ use identities relating to the period of sine, cosine, tangent as well as identities relating to negative angles and the Pythagorean Identity,
- ✓ construct functional models from trigonometric, exponential, polynomial and rational expressions,
- ✓ describe vectors in a mathematical and physical science context,
- ✓ add, subtract, and perform scalar multiplication on vectors,
- ✓ find and interpret the dot product of two vectors as a measure of agreement between vectors.

WEEK   SECTIONS TO COVER   Notes

WEEK	SECTIONS TO COVER	Notes
1	1.1, 1.2, 1.3	**1.1** (0.5 hr) This is basically review of the functions in 111. **1.2** (2 hr) Vertical reflections, shifts, and stretches. **1.3** (1 hr) Horizontal reflections, shifts, and stretches.
2	1.4, 1.5*	**1.4** (2 hr) Remember that multiple horizontal transformations can be quite confusing Tangent's interpretation as a slope is a useful tool. **1.5** (0-0.5 hr) Optional-ish. The theory behind the transformations in **1.2 − 1.4**.
3	2.4	**2.4** (1 hr) Definitions and general concept are important. Examples like solving for a value of *x* so that *f(x)=k* when given values help with sections 4.3 and 4.4.
	3.1, 3.2	**3.1** (1 hr) Mostly geometry review, but the Pythagorean Theorem and unit circle may be new.

		3.2	(2 hr) Sine and cosine for acute angles.

(Winter) *Martin Luther King Jr. Day Monday*

4	3.2, 3.3, 3.4	**3.3**	(1 hr) Sine and cosine of 30-45-60 degree angles. Angles larger than 360 degree and smaller than 0 degrees are defined.
		3.4	(1 hr) Graphs of $y=sin(x)$ and $y=cos(x)$, their vertical transformations, and applications thereof.

5	3.5, 3.6, 4.1	**3.5**	(1 hr) Definition of the tangent function and applications.
		3.6	(1 hr) Inverse trigonometric functions, specifically as they apply to right triangles.
		4.1	Definition of radian measure.

6	4.2, 4.3	**4.2**	(1.5 hr) Law of Sines and Law of Cosines. Try to avoid the temptation to spend too much time here.
		4.3	(2 hr) Solve equations of the form $f(x)=k$ where f is sinusoidal. Sinusoidal functions defined and inverse trigonometric functions are more completely defined.

7	4.4, 4.5*, 5.1	**4.4**	(2 hr) Building sinusoidal functions which fit certain criteria, with a focus on modeling situations. This and section 4.3 may be the hardest in the text.
		4.5	(0-0.5 hr) Trigonometric identities are optional. Only cover if you have extra time.
		5.1	Conceptual approach to vectors, definitions, and basic properties.

8	5.2, 5.3	**5.2**	(1 hr) Unit vector decompositions.
		5.3	(1.5 hr) Dot product is defined, as is "work".

9	5.4, 5.5	**5.4**	(2 hr) Applications of vectors in which vectors are physical quantities, those for which direction and magnitude make sense.
		5.5	(1.5 hr) Applications of vectors in which vectors are nothing more than lists.

(Fall) *Thanksgiving holiday Thursday/Friday.*

10			This week is most responsibly dedicated to (1) finishing up content if necessary, and then (2) in-class individual or small-group review with students. Consider also reviewing 111 material in anticipation of students taking Math 251, in which algebra is key.

   Catch-up, review
(Spring) *Memorial Day holiday Monday*

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11   Final exam during scheduled time

(http://registrar.uoregon.edu/calendars/final-exam-schedule?schedule=2015-2016)

Additional Notes
- It is extremely important that the students know that Math 112 is a precalculus course. It is designed for students who have an understanding of college algebra content that is to be built upon in order to prepare them for calculus. Not all students fit this description, but nevertheless it is the assumption.

- The content of this class may be different than you've experienced in a precalculus course (either taking one or if you've taught it elsewhere). There are fewer topics than in many other trigonometry curricula, with the goal of the topics being covered in depth and with lots of varying applications. Keep in mind that probably less than 5% of the students will go on to degrees in mathematics, and that the majority need a solid conceptual understanding of the topics in a scientific context.

- Common areas of difficulty: Basic algebra (factoring, simplifying and operations on fractions), horizontal transformations, completing the square, applications of any sort. Be conscious of these facts when you approach each topic so that you can be ready for the confused looks, frustrated sighs, and eye rolling. Combat them with detailed examples and ample opportunities for practice. Basic algebra review is most effective when integrated into new concepts, so do it on an as-needed basis.

- Mike has lecture guide/worksheets, quizzes, exams, and practice packets available upon request. (Unfortunately they are for a previous text, so while almost all of the topics are still germane, the section numbers and topics will be somewhat out of order)

Other Important Dates (http://registrar.uoregon.edu/calendars/academic?ts=Fall 2015):

Monday of 2nd week	Last day to drop without a "W" (but only 75% tuition refund)
Wednesday of 2nd week	Last day to add a class
Sunday after 7th week	Last day to drop --- period!