1 TOPICS OF FOCUS

I am mainly interested in a demonstration of your skills regarding the following topics:

- **Knowledge of what the unit circle is, how the trigonometric functions relate to the unit circle, and fluent ability to evaluate key values associated with the unit circle.**
- **Understand how arclength and central angle measure are related in the unit circle. How does this relate to radians?**
- **Explain the difference between degrees and radians. When would you use one over the other? What do radians have to do with arclength?**
- **Capacity to convert from degrees to radians and vice-versa; ability to recognize and use coterminal and reference angles**
- **Understand when trigonometric ratios and the Pythagorean Theorem are valid to use and how to use them. Understand how signs of trigonometric values change based on quadrants.**
- **Understand the Law of Sines and the Law of Cosines and know how to use them to solve applied problems involving triangles.**
- **How do you find the area of a triangle using trigonometry?**
- **Understand, use and manipulate trigonometric expressions using identities including Pythagorean identities, Quotient identities, cofunctions, sum/difference, double and half-angle formulas.**
- **Graphing: you should be able to determine the period, amplitude, phase shift and vertical shift of any trigonometric function (including tangent, secant and cosecant functions) both algebraically and graphically. Be able to graph these functions and identify key points such as roots, asymptotes, and local extrema (mins and maxes).**
- **Inverse trigonometric functions: understand how they are used to solve for unknowns, understand how to graph them and what their domains and ranges are.**
- **Understand how to evaluate compositions of inverse trigonometric functions and trigonometric functions**
- **Cofunctions: explain what they are using a graph. Apply cofunctions to solve problems.**
- **Rational and irrational numbers. How do you identify them?**
- **Vectors: how do you add them? How are they written? What is meant by vertical and horizontal components?**
- **What is the dot product? What does it mean for two vectors to be orthogonal?**
- **Can you convert between polar and Cartesian coordinates?**
- **Can you draw simple polar graphs, such as \( r = 2 \) or \( \theta = \frac{\pi}{4} \)?**
- **Why might one choose to use polar coordinates as opposed to Cartesian coordinates?**
2 STUDY RESOURCE LIST:

The following is a list of resources for you to study. Note that some of these resources repeat the same concepts/notions. Use them as they benefit you most.

- Test review questions from group activities
- ALEKS REVIEW (focus on topics that were listed above)
- exam 2
- exam 1
- The questions in this written review

3 REVIEW QUESTIONS

Be organized by writing your results/notes carefully on a separate sheet of paper. There is certainly not enough room on this sheet alone.

3.1 Essay Questions

Focus on the following essay-style questions. Use the rubric to check your responses. Make sure you answer every aspect of the question, noting that some questions have multiple questions embedded within them:

1. Explain the angle measurement system of radians. Why is it important?
2. Explain the angle measurement system of degrees. Why is it important?
3. Explain how the arc length on the perimeter of a circle is related to the central angle measure of the angle that intercepts the arc. What special thing happens if the circle is the unit circle?
4. Jane wants a slice of pizza that is 1 radian in size. She has a piece of string and a knife. How can she get her slice (approximately)?
5. State the domain and range of the function \( f(x) = \arcsin(x) \). Use this information to explain why \( \arcsin(\sin(3\pi/4)) \neq 3\pi/4 \). What is \( \arcsin(\sin(3\pi/4)) \)?
6. \( \arccos(\cos(3\pi/4)) = 3\pi/4 \). Why does this problem not have the same issue as \( \arcsin(\sin(3\pi/4)) \)?
7. Joe says that all the solutions to \( \tan x + 1 = 2 \) is \( x = \frac{\pi}{4} + 2k\pi \). Tama says the answer is \( x = \frac{\pi}{4} + k\pi \). Who is correct and why?
8. Explain why the equation \( \sin(x) = \frac{1}{2} \) has an infinite number of solutions, using either the unit circle or the graph \( y = \sin x \). What are the solutions in the interval \( [0, 2\pi] \)? What is the general solution?
9. What is the cofunction identity for sine and cosine? Use a picture to illustrate how it works.
10. Jeff claims that the vector \( \langle 3, 4 \rangle \) with an initial point at \( (0, 2) \) is the same as the vector \( \langle 3, 4 \rangle \) with an initial point at \( (0, 0) \). Timothy says that one is a vertical shift of the other, so they can’t be the same. Who is correct and why?
11. What is the equation of a circle of radius 3 centered at the origin in Cartesian coordinates? What is the equation of the same circle in polar coordinates? Use this example to explain why it might be preferable to work with some equations in polar form.
12. What does the graph of the polar equation \( \theta = \frac{\pi}{4} \) look like? How would you write this equation in Cartesian coordinates? Use this example to explain how to write the equation of a line in polar coordinates, using the concept of ”direction” in your explanation.
3.2 Worked Problem (Aleks-like) Questions

These problems constitute some, but not all of the topics you will be asked about on the final. Be sure to practice problems using the review in ALEKS, with a focus on the topics listed at the beginning of this document.

1. Find the reference angle for \( \frac{23\pi}{13} \). Draw a sketch of the angle \( \frac{23\pi}{13} \) in the unit circle, making sure it is in the correct quadrant.

2. Find an angle between \([0, 2\pi)\) that is coterminal with \( \frac{17\pi}{3} \).

3. Find the exact values of the amplitude, period, phase shift and vertical shift for the following function. Then, graph it over one period, labeling all local extrema, asymptotes and zeros.
   a. \( f(x) = -3\cos(2x - 4) + 3 \)
   b. \( f(x) = 2\sec(3x) \)
   c. \( f(x) = \sin\left(\frac{\pi}{4}x - \frac{\pi}{2}\right) \)

4. Find the exact value of \( \sin(75) \), using trigonometric identities.

5. Solve: (be sure to list ALL solutions)
   \[ 16\sin^2 x = 4 \]

6. Solve: (be sure to list ALL solutions)
   \[ \cos x = 0 \]

7. Solve: (be sure to list ALL solutions) Hint: think about identities
   \[ \cos(x) = -\sin(x) \]

8. Solve triangle ABC, given that \( B = 42^\circ \), \( a = 15 \), and \( c = 11 \). Round any answers to the nearest tenth.

9. Given that \( \sin \theta = \frac{7}{8} \), and that \( \theta \) lies in the second quadrant, find the other 5 trigonometric functions.

10. Are \( <5, -2> \) and \( <-4, -10> \) orthogonal?

11. Use the parallelogram process to draw a picture of \( v \), where \( v = <-2, 3> + <1, 1> \).