This review, produced by the Broward Teaching Center, contains a collection of questions which are representative of the type you may encounter on the exam. Other resources made available by the Teaching Center include:

- Walk-In tutoring at Broward Hall
- Private-Appointment, one-on-one tutoring at Broward Hall
- Walk-In tutoring in LIT 215
- Supplemental Instruction
- Video resources for Math and Science classes at UF
- Written exam reviews and copies of previous exams

The teaching center is located in the basement of Broward Hall:

You can learn more about the services offered by the teaching center by visiting https://teachingcenter.ufl.edu/
1. Graph the following trigonometric functions

(a) \( f(x) = 2 \cos \left( 3x + \frac{\pi}{2} \right) \)

(b) \( g(x) = -2 \tan \left( x + \frac{\pi}{4} \right) \)

(c) \( h(x) = \csc \left( \pi x - \frac{\pi}{2} \right) \)

2. Determine all values of \( x \) such that \( g(x) = -\tan \left( 4x + \frac{\pi}{3} \right) \) has vertical asymptotes.

3. Two surveyors plan to measure the height of a building, but do not have a tool for doing so directly. Both surveyors stand directly in front of the building, one fifty feet behind the other. To see the top of the building, the nearer surveyor has to look up, at a 50° angle. Similarly, the further surveyor must look up at an angle of 32° to see the top.

(a) Sketch a diagram including the building, and both surveyors, labeling all known angles and distances.

(b) Assuming the surveyor’s heights are negligible, determine the height of the building.

4. A helicopter is hovering at a fixed altitude between two women standing 100 feet apart from each other. One woman measures the angle of elevation between herself and the helicopter to be 25°, and the other measures the angle of elevation between herself and the helicopter to be 40°.

(a) Sketch a diagram including the helicopter and both women. Label all known distances and angles.

(b) Determine the altitude of the helicopter.

5. Determine (where possible) the value of the following expressions

(a) \( \sin (\sin^{-1}(1)) \)  
(b) \( \cos (\cos^{-1}(\sqrt{2}/2)) \)  
(c) \( \cos^{-1}(\cos(-5\pi/6)) \)  
(d) \( \tan(\cos^{-1}(-\sqrt{3}/2)) \)  
(e) \( \tan (\sin^{-1}(1/3)) \)  
(f) \( \sin^{-1}(\sin(2)) \)  
(g) \( \cos^{-1}(\sin(\pi/3)) \)  
(h) \( \sin^{-1}(\sin(8\pi/7)) \)
6. Rewrite the following as algebraic expressions
   (a) \( \tan(\sin^{-1}(u)) \)
   (b) \( \csc(\cos^{-1}(x/3)) \)

7. Use trigonometric identities to simplify \( \frac{\cos^3(\theta) - \sin^3(\theta)}{1 + \cos(\theta)\sin(\theta)} \).

8. An aircraft takes off headed \( N15^\circ E \), and flies in that direction for one mile. Then the aircraft turns \( 90^\circ \) toward the North-West and travels in this direction for two miles. At this moment, what is the bearing from the airport where the aircraft took off to the position of the aircraft?

9. Verify the following identities
   (a) \( \frac{1 - \sin \theta}{\cos \theta} + \frac{\cos \theta}{1 - \sin \theta} = 2 \sec \theta \)
   (b) \( \frac{\csc \theta + \cot \theta}{\cot \theta} = \frac{\tan^2 \theta}{\sec \theta - 1} \)
   (c) \( \csc^6 x \cot x = (\cot x + 2 \cot^3 x + \cot^5 x) \csc^2 x \)

10. Evaluate using the periodicity and even/odd properties:
    (a) \( \cot \left( -\frac{17\pi}{2} \right) \)
    (b) \( \sin \left( -\frac{7\pi}{3} \right) \)
    (c) \( \cos \left( \frac{11\pi}{6} \right) \)
    (d) \( \tan \left( \frac{7\pi}{4} \right) \)
    (e) \( \csc(570^\circ) \)
    (f) \( \sec(-450^\circ) \)

11. Suppose \( \sin(\theta) = \frac{1}{4} \) and \( \cot(\theta) > 0 \). Find:
    (a) \( \cos(\theta) \)
    (b) \( \tan(\theta) \)
    (c) \( \sec(\theta) \)
    (d) \( \csc(\theta) \)
12. Suppose the terminal side of $\theta$ lies on the line $2x + 3y = 0$ in quadrant IV. Find the values of the six trigonometric function of $\theta$.

13. See below:
   
   (a) Calculate $\cos\left(\frac{\pi}{2} - \theta\right)$, assuming $\cos(\theta) = \frac{1}{4}$.
   
   (b) Calculate $\cos\left(\frac{\pi}{2} - \theta\right)$, assuming $\cot(\theta) = 3$.

14. Perform the operations and simplify:
   
   a) $(1 + \tan x)^2 - 2 \tan x$
   
   b) $\sin t + \cot t \cos t$
   
   c) $\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{1 + \sin \theta}$

15. Factor:
   
   a) $\sin^3 \theta - \cos^3 \theta$
   
   b) $2 \sec^2 x + 3 \tan x - 1$
1) Graph the following equations:
   a) \( y = 2 \cos \left( 3x + \frac{\pi}{2} \right) - 1 \)
   b) \( y = -2 \tan \left( x + \frac{\pi}{2} \right) \)
   c) \( y = \csc \left( \pi x - \frac{\pi}{2} \right) + 3 \)

2) List all values of \( x \) for which the function \( g(x) = -\tan \left( 4x + \frac{\pi}{2} \right) \) has vertical asymptotes.

3) To measure the height of a building, two sightings, 50 feet apart from one another, are taken from one side of the building. If the first angle of elevation is 50° and the second is 32°, what is the height of the building?

4) Two observers simultaneously measure the angle of elevation of a helicopter (one from each side). One angle is measured as 25° and the other as 40°. If the observers are 100 feet apart, and the helicopter lies over the line joining them, how high is the helicopter?

5) Evaluate the following expressions:
   a) \( \sin(\sin^{-1} 1) \)
   b) \( \sin(\sin^{-1} 2) \)
   c) \( \cos \left( \arccos \left( \frac{\sqrt{2}}{2} \right) \right) \)
   d) \( \arccos \left( \cos \left( -\frac{5\pi}{6} \right) \right) \)
   e) \( \tan \left( \cos^{-1} \left( -\frac{\sqrt{2}}{2} \right) \right) \)
   f) \( \tan \left( \sin^{-1} \left( \frac{1}{3} \right) \right) \)
   g) \( \cos^{-1} \left( \sin \left( \frac{\pi}{3} \right) \right) \)
   h) \( \cos^{-1} \left( \sin \left( \frac{8\pi}{7} \right) \right) \)

6) Rewrite as an algebraic expression:
   a) \( \tan(\arcsin u) \)
   b) \( \csc \left( \cos^{-1} \frac{x}{3} \right) \)

7) Simplify:

\[
\frac{\cos^3 \theta - \sin^3 \theta}{1 + \cos \theta \sin \theta}
\]

8) An aircraft takes off a runway which has a bearing of N15°E. After flying for 1 mile, the pilot of the aircraft requests permission to turn 90° and head toward the north west. The request is granted. After the plane goes 2 miles in this direction, what bearing should the control tower use to locate the aircraft?

9) The moon is directly over Gainesville when, due to an experiment in the physics department, it explodes, and a shard of lunar rock hurtles toward Paynes Prairie at 200 miles/sec. If the shard makes a descent angle with the horizon of 15° how many minutes will it take the shard to descend 12,000 miles?
10) Verify each identity:
   a) \( \frac{1 - \sin \theta}{\cos \theta} + \frac{\cos \theta}{1 - \sin \theta} = 2 \sec \theta \)
   b) \( \frac{\csc \theta + \cot \theta}{\cot \theta} = \frac{\tan^2 \theta}{\sec \theta - 1} \)
   c) \( \csc^6 x \cot x = (\cot x + 2 \cot^3 x + \cot^5 x) \csc^2 x \)

11) Evaluate:
   a) \( \tan\left(-\frac{17\pi}{2}\right) \)
   b) \( \cos\left(-\frac{7\pi}{3}\right) \)
   c) \( \sin\left(\frac{11\pi}{6}\right) \)
   d) \( \cot\left(\frac{7\pi}{4}\right) \)
   e) \( \csc(390^\circ) \)
   f) \( \sec(-540^\circ) \)

12) Given the following values, find the values of the other five trig functions for the same angle:
   a) \( \sin \theta = \frac{1}{3} \)
   b) \( \cot \theta = 3 \)

13) Write three equations for the graph below. At least one of the equations should have a different trigonometric function from the other.

14) The terminal side of \( \theta \) lies on the line \( x + 2y = 0 \) in the quadrant IV. Find the values of the six trigonometric functions of \( \theta \).

15) a. Given that \( \cos(\theta) = \frac{1}{4} \), find \( \cos(90 - \theta) \).
   b. Given that \( \cot(\theta) = 3 \), find \( \cos(90 - \theta) \).