November 19, 1998

Math 6
Exam 2
Name
Section

11. (6 pts) Use the fundamental identities and factorization where necessary to simplify.

(a) \( \frac{\cos^2 y}{1 - \sin y} \)

(b) \( \sin^2 x \sec^2 x - \sin^2 x \)

12. (6 pts) Use the trigonometric substitution to write the algebraic expression as a trigonometric function of \( \theta \), where \( 0 < \theta < \frac{\pi}{2} \).

\( \sqrt{x^2 - 4}, \quad x = 2 \sec \theta \)

13. (10 pts) Match the trigonometric expression with one of the following simplified expressions (A-J). Letters can be used more than once.

(a) \( \frac{\cos x}{\csc x} \) = ________

(b) \( (\sec x + 1)(\sec x - 1) \) = ________

(c) \( \cos \left( \frac{\pi}{2} - x \right) \sec x \) = ________

(d) \( \tan^4 x + 2 \tan^2 x + 1 \) = ________

(e) \( \frac{\sin(-x)}{\cos(-x)} \) = ________

(f) \( \cos x \tan x \) = ________
(30 pts) Verify the following identities. Only work from 1 side. Work must be neat!

(a) \[ \frac{\cos \theta \cot \theta}{1 - \sin \theta} - 1 = \csc \theta \]

(b) \[ \sin x \left(1 - 2 \cos^2 x + \cos^4 x\right) = \sin^5 x \]

(c) \[ \csc x - \sin x = \cos x \cot x \]
(28 pts) Find all solutions in the interval \([0, 2\pi]\) of the following trigonometric equations. Show all work! Give exact solutions.

(a) \(2 \sin^2 x = 2 + \cos x\)

(b) \(2 \sec^2 x + \tan^2 x - 3 = 0\)

(c) \(\cot x \cos^2 x = 2 \cot x\)
6. (10 pts) A flagpole is mounted on the front of a library's roof. From a point 100 feet in front of the library, the angle of elevation to the base of the flagpole and the top of the flagpole are 28° and 39°. Find the height of the flagpole and the height of the library. (Round answers to the nearest whole number.)

7. (10 pts) An airplane flying at 550 miles per hour has a bearing of N52°E. After flying 1.5 hours, how far north and how far east will the plane have traveled from its point of departure?