Honors Precal 5.1: Verifying Trig Identities

GOAL: Show one side can be simplified so it is identical to the other side.

Reciprocal Identities		Quotient Identities		Pythagorean Identities
$\csc\theta = \frac{1}{\sin\theta}$	$\sin\theta = \frac{1}{\csc\theta}$	$\tan\theta = \frac{\sin\theta}{\cos\theta}$	$\cot\theta = \frac{\cos\theta}{\sin\theta}$	$\sin^2\theta + \cos^2\theta = 1$
$\sec\theta = \frac{1}{\cos\theta}$	$\cos\theta = \frac{1}{\sec\theta}$			$\tan^2\theta + 1 = \sec^2\theta$
$\cot\theta = \frac{1}{\tan\theta}$	$\tan\theta = \frac{1}{\cot\theta}$			$\cot^2\theta + 1 = \csc^2\theta$

Fraction Rules					
	LEGAL:	$\frac{a}{b}\bullet\frac{c}{a} = \frac{c}{b}$	$\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$	$\frac{ab}{c} = \frac{a}{c}b$	$\frac{b(a+b)}{b^2} = \frac{a+b}{b}$
	ILLEGAL!!	$\frac{a}{b}\bullet\frac{c}{b} = ac$	$\frac{a}{b+c} = \frac{a}{b} - \frac{a}{c}$	$\frac{ab}{c} = \frac{a}{c}\bullet\frac{b}{c}$	$\frac{a+b}{b} = a$

Three Fraction Hints				
	$\frac{\frac{1}{x}}{\frac{1}{y}}$	$\frac{1+\frac{1}{x}}{y+\frac{y}{x}}$	$\frac{\frac{1}{xy}}{\frac{1}{y}+\frac{1}{x}}$	$\frac{a}{1-b}$

Try:		Hints:
Changing to sines/cosines	Multiplying num & den by conjugate of den.	Copy carefully!
Combining fractions	Factoring (try changing to variables first)	Start with the most complicated side
Separating fractions	Simplifying parentheses	Don't undo what you just did
Using formula (esp with 1 or trig²x)	SOMETHING!!	Only deal with one side

1. $\sec x \cot x = \csc x$

2. $\sin\theta(\cot\theta + \tan\theta) = \sec\theta$

3. $\cos x - \cos x \sin^2 x = \cos^3 x$

4. $\sec\theta + \tan\theta = \frac{1+\sin\theta}{\cos\theta}$

5. $\frac{\csc^2 x}{\cot x} = \csc x \sec x$

6. $\csc x + \cot x = \frac{\sin x}{1-\cos x}$

7. $\csc\theta \sin\theta - \sin^2\theta = \cos^2\theta$

8. $(\csc\theta + \cot\theta)(\csc\theta - \cot\theta) = 1$

9. $\sin\theta \csc\theta = 1$

10. $\cos x + \sin x \tan x = \sec x$

11. $\frac{\csc\theta - 1}{\cot\theta} = \frac{\cot\theta}{\csc\theta + 1}$

12. $\cos^2 x - \sin^2 x = 1 - 2\sin^2 x$

13. $\csc^4\theta - \csc^2\theta = \cot^4\theta + \cot^2\theta$

14. $\cot^2 y(\sec^2 y - 1) = 1$

15. $\frac{\tan x + \cot y}{\tan x \cot y} = \tan y + \cot x$

16. $\csc\theta \cdot \cos\theta = \cot\theta$

17. $\cos\theta(\tan\theta + \cot\theta) = \csc\theta$

18. $(\sec\theta - 1)(\sec\theta + 1) = \tan^2\theta$

19. $\frac{\csc\theta - 1}{\cot\theta} = \frac{\cot\theta}{\csc\theta + 1}$

20. $1 - \frac{\sin^2\theta}{1+\cos\theta} = \cos\theta$

21. $(\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2 = 2$

22. $\tan^2 x + 6 = \sec^2 x + 5$

23. $\tan\theta \cot\theta - \cos^2\theta = \sin^2\theta$

24. $\frac{\sec x}{\csc x} + \frac{\sin x}{\cos x} = 2\tan x$

25. $\frac{\sec\theta}{1-\sin\theta} = \frac{1+\sin\theta}{\cos^3\theta}$

26. $\sec\theta - \tan\theta = \frac{\cos\theta}{1+\sin\theta}$

27. $\sec^4\theta - \sec^2\theta = \tan^4\theta + \tan^2\theta$

28. $\cos^2\theta(1 + \tan^2\theta) = 1$

If you feel overwhelmed, take a moment to enjoy this pig with a flower.