Act 21 *Skills 20 and 21

**Section 7.1: Simplifying and Manipulating Trig Expressions**

1. Let $x = 7\cot\theta$. Evaluate $\sin\theta$ in terms of $x$.

2. Use $x = 4\sin\theta$ to express $\frac{7x^2}{\sqrt{16-x^2}}$ as a trigonometric function without radicals. Assume θ is an acute angle.

3. Factor and use identities to simplify completely: $\frac{\tan^4 x - \sec^4 x}{\sec^2 x + \tan^2 x}$

4. Multiply and use identities to reduce the number of terms in your final answer: $(1 + \tan x)^2$

* 5. Let $x = 6\cot\theta$. Write $\sin\theta$ in terms of $x$.

* 6. Use $x = 3\tan\theta$. Write $\frac{6x}{\sqrt{9+x^2}}$ as a trigonometric function without radicals. Assume θ is an acute angle.

7. Use identities to factor and simplify: $\dfrac{\csc^4 x - \cot^4 x}{\csc^2 x + \cot^2 x}$

* 8. Use an identity to rewrite $1 + \cos x - 2\sin^2 x$ in terms of one trig function and then factor the expression.

**Section 7.1: Proving Trig Identities**

Prove the following identities by working each side independently. Show every step!

1. $(\cos x + \sin x)(1 - \sin x \cos x) = \cos^3 x + \sin^3 x$

2. $\cot x + \csc x = \dfrac{\sin x}{1 - \cos x}$

3. $\dfrac{1 + \sin t}{\cos t} + \dfrac{\cos t}{1 + \sin t} = 2\sec t$

*4. $\dfrac{\sec t + 1}{\tan t} = \dfrac{\tan t}{\sec t - 1}$

5. $\dfrac{\cot A + \tan A}{\sec A + \csc A} = \dfrac{1}{\sin A + \cos A}$

6. $\sec^4 x - \tan^2 x = \tan^4 x + \sec^2 x$

**Section 7.2: Sum/Difference Identities**

1. Let the coordinates on the unit circle of the standard angle α be (3/5, 4/5) and let cos β be 1/6 with the terminal side of β in quadrant IV. Evaluate cos(α + β) exactly.

* 2. Suppose sin α = -3/11 with α a third quadrant angle, and cos β = 1/5, with β a first quadrant angle. Evaluate cos(α + β) exactly.

3. Let tan γ = 2/5 with γ a first quadrant angle. Evaluate sin (γ - 90°) exactly. Use any method you wish.

* 4. Suppose sin α = 3/7 with α a second quadrant angle, and cos β = 1/8, with β a first quadrant angle. Evaluate sin(α + β) exactly.

5. Evaluate cos β and $\sin\left(\frac{\pi}{2} - \beta\right)$ exactly if sin β > 0 and tan β = -15/4.

* 6. $\sin(\tan^{-1}(6/7) + \cos^{-1}(-1/3))$

7. Rewrite sin 23° cos 22° + cos 23° sin 22° as a trig function of a single angle and then evaluate exactly.

**Section 7.3: Double Angle Identities**

1. Let sin δ = 5/8, where the terminal side of δ is in quadrant II. Evaluate sin 2δ.

2. Evaluate sin(2$x$) exactly, if cos $x$ = 8/9 with $3\pi/2 < x < 2\pi$

3. Prove: tan $x$ + cot $x$ = 2 csc (2$x$)

4. Prove: $\frac{\cos^3 x + \sin^3 x}{\cos x + \sin x} = \frac{2 - \sin 2x}{2}$

**Half Angle Identities**

1. Use a half angle formula to evaluate cos ($11\pi/12$) exactly.

2. Evaluate cos (15°) exactly. Use any method you wish.

3. Evaluate sin(112.5°) exactly.

* 4. cos $\alpha$ = ¼ and $\alpha \in$ (270°, 360°)

   a. Evaluate cos ($\alpha/2$)

   b. Evaluate sin ($\alpha/2$)

More Problems

#1 of this dept. handout http://mathdepartment.us/departmentHandouts/math122/problems_using_trig_identities

Simplifying Trig Expressions http://mathdepartment.us/departmentHandouts/math122/simplifying_trig_expressions