King Fahd University of Petroleum and Minerals
Prep-Year Math Program
Math 002 - Term 132
Recitation (7.2)

Question 1: Simplify the following expression $\dfrac{(\sec\theta - \tan\theta)^2 + 1}{\sec\theta\csc\theta - \tan\theta\csc\theta} = ?$

Answer: $2\tan\theta$

Question 2: Verify the following identities

(a): $\dfrac{\cot\theta - \csc\theta}{\cot\theta + \csc\theta} = \dfrac{\cos\theta - 1}{\cos\theta + 1}$

(b): $\dfrac{1}{1 - \cos x} - \dfrac{\cos x}{1 + \cos x} = 2\csc^2 x - 1$

Solution:

(a): $LHS = \dfrac{\cot\theta - \csc\theta}{\cot\theta + \csc\theta} = \dfrac{\dfrac{\cos\theta}{\sin\theta} - \dfrac{1}{\sin\theta}}{\dfrac{\cos\theta}{\sin\theta} + \dfrac{1}{\sin\theta}} = \dfrac{\sin\theta}{\sin\theta} \cdot \dfrac{\dfrac{\cos\theta}{\sin\theta} - \dfrac{1}{\sin\theta}}{\dfrac{\cos\theta}{\sin\theta} + \dfrac{1}{\sin\theta}} = \dfrac{\cos\theta - 1}{\cos\theta + 1}$

(b):

$$LHS = \dfrac{1}{1 - \cos x} - \dfrac{\cos x}{1 + \cos x} = \dfrac{1 + \cos x - \cos x(1 - \cos x)}{(1 - \cos x)(1 + \cos x)}$$

$$= \dfrac{\cos^2 x + 1}{1 - \cos^2 x}$$

$$= \dfrac{\cos^2 x + 1}{\sin^2 x}$$

$$= \dfrac{\cos^2 x}{\sin^2 x} + \dfrac{1}{\sin^2 x}$$

$$= \cot^2 x + \csc^2 x$$

$$= \csc^2 x - 1 + \csc^2 x$$

$$= 2\csc^2 x - 1$$

Question 3:

$\dfrac{\sin^2(-x) - \cos^2(-x)}{\sin(-x) - \cos(-x)} =$

- a) $-\sin x - \cos x$
- b) $-2\sin x$
- c) $\sin x - \cos x$
- d) $\cos x - \sin x$
- e) $\sin x + \cos x$

Answer: d)

Question 4: $\dfrac{\sec x - 1}{\sec x + 1} - \dfrac{\sec x + 1}{\sec x - 1} =$

a) $-4\csc x \cot x$

b) $-4\sec x \tan x$

c) $4\csc x \cot x$

d) $8\sec x \tan x$

e) $-2\sec x \tan x$

Answer: a) $-4\csc x \cot x$