122 §2.2 #s $\frac{1\text{–}8}{\text{ALL}}$, 9, 12, 15, ..., 48, 59, 63, 64

(1) An eq'n that's true for all values in its domain is an identity.

(2) An eq'n that is true for only some values in its domain is a conditional equation.

(3) $\frac{1}{\cot u} = \tan u$

(4) $\frac{\cos u}{\sin u} = \cot u$

(5) $\sin^2 u + \cos^2 u = 1$

(6) $\cos\left(\frac{\pi}{2} - u\right) = \sin u$

(7) $\csc(-u) = -\csc u$

(8) $\sec(-u) = \sec u$.

#s 9-50 Verify the identity

(9) $\tan t \cot t = \frac{\sin t}{\cos t} \cdot \frac{\cos t}{\sin t} = 1$

(11) $\cot^2 y (\sec^2 y - 1) = \cot^2 y \tan^2 y = 1$

(13) $(1+\sin\alpha)(1-\sin\alpha) = 1 - \sin^2\alpha = \cos^2\alpha$

DANG!

(12) $\cos x + \sin x \tan x = \cos x + \frac{\sin^2 x}{\cos x}$

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

122 §2.2 #s 15, 18, 21, 48, 59, 63, 64

(15) $\cos^2\beta - \sin^2\beta = 1 - \sin^2\beta - \sin^2\beta = 1 - 2\sin^2\beta$

(18) $\dfrac{\cot^2 t}{\csc t} = \dfrac{\dfrac{\cos^2 t}{\sin^2 t}}{\dfrac{1}{\sin t}} = \dfrac{\cos^2 t}{\sin^2 t} \cdot \sin t$

$= \dfrac{\cos^2 t}{\sin t} = \dfrac{1 - \sin^2 t}{\sin t}$

(21) $\sin^{\frac{1}{2}} x \cos x - \sin^{5/2} x \cos x = \cos^3 x \sqrt{\sin x}$?

$= \sin^{\frac{1}{2}} x \cos x \left[1 - \sin^2 x\right] = \sin^{\frac{1}{2}} x \cos x \left[\cos^2 x\right]$

$= \cos^3 x \sqrt{\sin x}$

$\dfrac{\sin^{\frac{5}{2}} x \cos x}{\sin^{\frac{1}{2}} x \cos x} = \sin^{\frac{4}{2}} x$

(24) $\dfrac{\sec\theta - 1}{1 - \cos\theta} = \sec\theta$?

$\dfrac{(\sec\theta - 1)}{(1 - \cos\theta)}\left(\dfrac{\sec\theta + 1}{\sec\theta + 1}\right) = \dfrac{\sec^2\theta - 1}{\sec\theta + 1 - \cos\theta\sec\theta - \cos\theta}$

$= \dfrac{\tan^2\theta}{\sec\theta + 1 - 1 - \cos\theta} = \dfrac{\frac{\sin^2\theta}{\cos^2\theta}}{\sec\theta - \cos\theta} = \dfrac{\sin^2\theta}{\cos^2\theta} \cdot \dfrac{1}{\sec\theta - \cos\theta}$

$= \dfrac{\sin^2\theta}{\cos^2\theta} \cdot \dfrac{1}{1 - \cos^2\theta} = \dfrac{\sin^2\theta}{\cos\theta} \cdot \dfrac{\cos\theta}{\sin^2\theta} = \sec\theta$

122 §8.2 #s 27, 30, 33, 36, 39, 48, 59, 63, 64

(27) $\frac{1}{\tan x} + \frac{1}{\cot x} = \frac{\cot x}{\tan x \cot y} + \frac{\tan x}{\tan x \cot x}$

$= \frac{\cot x + \tan x}{1} = \cot x + \tan x$

Dang! Just $\frac{1}{\tan x} = \cot x$ & $\frac{1}{\cot x} = \tan x$ would've done it!

(30) $\frac{\cos x \cot x}{1 - \sin^2 x} - 1 = \frac{\cos x \left(\frac{\cos x}{\sin x}\right)}{1 - \sin^2 x} - \frac{(1 - \sin^2 x)}{1 - \sin^2 x}$

$= \frac{\frac{\cos^2 x}{\sin x} - (1 - \sin^2 x)}{1 - \sin^2 x} = \frac{\frac{\cos^2 x - \sin x (1 - \sin^2 x)}{\sin x}}{1 - \sin^2 x}$

$= \frac{\cos^2 x - \sin x + \sin^3 x}{\sin x (1 - \sin^2 x)} = \frac{1 - \sin x}{\sin x (1 - \sin^2 x)} = \csc x$ ✓

(33) $\tan\left(\frac{\pi}{2} - \theta\right) \tan\theta = \cot\theta \tan\theta = 1$

(36) $\frac{\csc(-x)}{\sec(-x)} = \frac{\frac{-1}{\sin x}}{\frac{1}{\cos x}} = -\frac{1}{\sin x} \cdot \frac{\cos x}{1} = -\cot x$

(39) $\frac{\tan x + \cot y}{\tan x \cot y} = \frac{\frac{\sin x}{\cos x} \cdot \frac{\sin y}{\sin y} + \frac{\cos y}{\sin y} \cdot \frac{\cos x}{\cos x}}{\frac{\sin x \cos y}{\cos x \sin y}}$

$= \frac{\sin x \sin y + \cos y \cos x}{\cos x \sin y} \cdot \frac{\cos x \sin y}{\sin x \cos y} = \tan y + \cot x$

122 §2.2 #'s 42, 45, 48, 59, 63, 64

(42) $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \frac{|1-\cos\theta|}{|\sin\theta|}$?

$$\sqrt{\frac{1-\cos\theta}{1+\cos\theta}\cdot\frac{1-\cos\theta}{1-\cos\theta}} = \sqrt{\frac{(1-\cos\theta)^2}{1-\cos^2\theta}}$$

$$= \sqrt{\frac{(1-\cos\theta)^2}{\sin^2\theta}} = \frac{|1-\cos\theta|}{|\sin\theta|} = \frac{1-\cos\theta}{|\sin\theta|},$$

since $1-\cos\theta \geq 0$.

(45) $\sin t \csc\left(\frac{\pi}{2}-t\right) = \sin t \sec t = \frac{\sin t}{\cos t} = \tan t$

(48) $\cos(\sin^{-1} x) = \sqrt{1-x^2}$ ✓

(59) Verify $\tan^5 x = \tan^3 x \sec^2 x - \tan^3 x$

$\tan^5 x = \tan^3 x[\sec^2 x - 1] = \tan^3 x \sec^2 x - \tan^3 x$ ✓

122 § 2.2 #s 63, 64

*s63-64 Use cofunction id's to evaluate sans calculator.

$90^\circ - 25^\circ = 65^\circ$

(63) $\sin^2(25^\circ) + \sin^2(65^\circ)$

$= \cos^2(65^\circ) + \sin^2(65^\circ) = \boxed{1}$!

(64) $\tan^2 63^\circ + \cot^2 16^\circ - \sec^2 74^\circ - \csc^2 27^\circ$

$= \cot^2 27^\circ - \csc^2 27^\circ + \tan^2 74^\circ - \sec^2 74^\circ$

$= \csc^2 27^\circ - 1 - \csc^2 27^\circ + \sec^2 74^\circ - 1 - \sec^2 74^\circ$

$= \boxed{-2}$!!