5.1 HW WS **Name**_____

Simplifying Trigonometric Expressions

Reduce all expressions to a single term.

1. $\cos x + \sin x \cdot \tan x$
2. $\sin^3 x + \cos^2 x \cdot \sin x$
3. $\sin x + \dfrac{\cos^2 x}{\sin x}$
4. $\dfrac{\cos x}{1-\sin x} \cdot \dfrac{\cos x}{1+\sin x}$
5. $\dfrac{1}{\cos^2 x} - \dfrac{1}{\cot^2 x}$
6. $\sec x \cdot \csc x - \tan x$
7. $1 + (\sec x - \tan x)(\sec x + \tan x)$
8. $\cos x(\tan x + \cos x \cdot \csc x)$
9. $\dfrac{\sin x + \cos x \cdot \cot x}{\cot x}$
10. $\dfrac{(1+\cos x)^2 + \sin^2 x}{1+\cos x}$

---

11. $(\csc x + \cot x)(1 - \cos x)$
12. $\sin x \cdot \tan x + \cos x$
13. $\csc x - \cot x \cdot \cos x$
14. $\tan x(1 - \cot^2 x) + \cot x(1 - \tan^2 x)$
15. $(\sec x - \tan x)(1 + \csc x)$
16. $(\sec x + \tan x)(1 - \sin x)$
17. $\dfrac{\sin x \cdot \cot x + \cos x}{2\cot x}$
18. $\sec x(\sec x - \cos x)$
19. $\csc^2\theta - \cos^2\theta \csc^2\theta$
20. $\dfrac{(\cos\theta + \sin\theta)^2 - 1}{\cos\theta}$
21. $\dfrac{\sin x + \tan x}{\tan x(\csc x + \cot x)}$

You must complete 1-10 on a separate paper, showing all steps neatly, working down the page. 11-21 are extra problems that can be done in preparation of the quiz/test.

5.1 HW WS

1) $\cos x + \sin x \cdot \tan x$

$\frac{\cos x}{1} + \frac{\sin x}{1} \cdot \frac{\sin x}{\cos x}$ (cosx, cosx)

$\frac{\cos^2 x + \sin^2 x}{\cos x}$

$\frac{1}{\cos x} = \boxed{\sec x}$

2) $\sin^3 x + \cos^2 x \cdot \sin x$

$\sin x(\sin^2 x + \cos^2 x)$

$\sin x(1) = \boxed{\sin x}$

3) $\frac{\sin x}{1} + \frac{\cos^2 x}{\sin x}$ (sinx, sinx)

$\frac{\sin^2 x + \cos^2 x}{\sin x}$

$\frac{1}{\sin x} = \boxed{\csc x}$

4) $\frac{\cos x}{(1-\sin x)} \cdot \frac{\cos x}{(1+\sin x)}$

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

$\frac{\cos^2 x}{\cos^2 x} = \boxed{1}$

5) $\frac{1}{\cos^2 x} - \frac{1}{\cot^2 x}$

$\sec^2 x - \tan^2 x$

$= \boxed{1}$

6) $\sec x \cdot \csc x - \tan x$

$\frac{1}{\cos x} \cdot \frac{1}{\sin x} - \frac{\sin x}{\cos x}$ (sinx, sinx)

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

$\frac{\cos^2 x}{\cos x \sin x}$

$\frac{\cos x}{\sin x} = \boxed{\cot x}$

7) $1 + (\sec x - \tan x)(\sec x + \tan x)$

$1 + (\sec^2 x - \tan^2 x)$

$1 + 1 = \boxed{2}$

8) $\cos x(\tan x + \cos x \cdot \csc x)$

$\cos x\left(\frac{\sin x}{\cos x} + \frac{\cos x}{1} \cdot \frac{1}{\sin x}\right)$

$\frac{\cos x \cdot \sin x}{\cos x (\sin x)} + \frac{\cos^2 x}{\sin x}$ (sinx)

$\frac{\sin^2 x + \cos^2 x}{\sin x}$

$\frac{1}{\sin x} = \boxed{\csc x}$

9) $\frac{\sin x + \cos x \cdot \cot x}{\cot x}$

$\frac{\sin x}{\cot x} + \frac{\cos x \cdot \cot x}{\cot x}$

$\frac{\sin x}{1} \cdot \frac{\cos x}{\sin x} + \cos x$

$= \boxed{2\cos x}$

10) $\frac{(1+\cos x)^2 + \sin^2 x}{1+\cos x}$

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

$1 + \cos x + \frac{(1+\cos x)(1-\cos x)}{1+\cos x}$

$1 + \cos x + 1 - \cos x$

$= \boxed{2}$

11) $(\csc x + \cot x)(1-\cos x)$

$\left(\frac{1}{\sin x} + \frac{\cos x}{\sin x}\right)\frac{(1-\cos x)}{1}$

$\frac{(1+\cos x)(1-\cos x)}{\sin x}$

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

$\frac{\sin^2 x}{\sin x} = \boxed{\sin x}$

(12) $\sin x \cdot \tan x + \cos x$

$\frac{\sin x}{1} \cdot \frac{\sin x}{\cos x} + \frac{\cos x}{1} \cdot \frac{(\cos x)}{(\cos x)}$

$\frac{\sin^2 x + \cos^2 x}{\cos x}$

$\frac{1}{\cos x} = \boxed{\sec x}$

(13) $\csc x - \cot x \cdot \cos x$

$\frac{1}{\sin x} - \frac{\cos x}{\sin x} \cdot \frac{\cos x}{1}$

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

$\frac{\sin^2 x}{\sin x} = \boxed{\sin x}$

(14) $\tan x(1 - \cot^2 x) + \cot x(1 - \tan^2 x)$

$\tan x - \frac{\tan x}{1} \cdot \frac{1}{\tan^2 x} + \cot x - \frac{\cot x}{1} \cdot \frac{1}{\cot^2 x}$

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

$\tan x - \cot x + \cot x - \tan x$

$= \boxed{0}$

(15) $(\sec x - \tan x)(1 + \csc x)$

$\left(\frac{1}{\cos x} - \frac{\sin x}{\cos x}\right)\left(\frac{(\sin x)}{1} + \frac{1}{\sin x}\right)$

$\frac{(1 - \sin x)}{\cos x} \cdot \frac{(\sin x + 1)}{\sin x}$

$\frac{\sin x + 1 - \sin^2 x - \sin x}{\sin x \cdot \cos x}$

$\frac{1 - \sin^2 x}{\sin x \cdot \cos x}$

$\frac{\cos^2 x}{\sin x \cdot \cos x}$

$\frac{\cos x}{\sin x} = \boxed{\cot x}$

(16) $(\sec x + \tan x)(1 - \sin x)$

$\left(\frac{1}{\cos x} + \frac{\sin x}{\cos x}\right)(1 - \sin x)$

$\left(\frac{1 + \sin x}{\cos x}\right)\left(\frac{1 - \sin x}{1}\right)$

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

$\frac{\cos^2 x}{\cos x} = \boxed{\cos x}$

(17) $\dfrac{\sin x \cdot \cot x + \cos x}{2\cot x}$

$\dfrac{\frac{\sin x}{1}\cdot\frac{\cos x}{\sin x} + \cos x}{\left(\frac{2}{1}\right)\left(\frac{\cos x}{\sin x}\right)}$

$\dfrac{2\cos x}{\frac{2\cos x}{\sin x}} \rightarrow \dfrac{2\cos x}{1}\cdot\dfrac{\sin x}{2\cos x}$

$= \boxed{\sin x}$

(18) $\sec x(\sec x - \cos x)$

$\sec^2 x - \sec x \cos x$

$\sec^2 x - \dfrac{1}{\cos x}\cdot\dfrac{\cos x}{1}$

$\sec^2 x - 1 = \boxed{\tan^2 x}$

(19) $\csc^2\theta - \cos^2\theta\csc^2\theta$

$\csc^2\theta(1-\cos^2\theta)$

$\dfrac{1}{\sin^2\theta}\left(\dfrac{\sin^2\theta}{1}\right) = \boxed{1}$

(20) $\dfrac{(\cos\theta+\sin\theta)^2 - 1}{\cos\theta}$

$\dfrac{\cos^2\theta + 2\sin\theta\cos\theta + \sin^2\theta - 1}{\cos\theta}$

$\dfrac{1 + 2\sin\theta\cos\theta - 1}{\cos\theta} = \boxed{2\sin\theta}$

(21) $\dfrac{\sin x + \tan x}{\tan x(\csc x + \cot x)}$

$\dfrac{\frac{\sin x}{1} + \frac{\sin x}{\cos x}}{\frac{\sin x}{\cos x}\left(\frac{1}{\sin x} + \frac{\cos x}{\sin x}\right)}$

$\dfrac{\frac{\sin x\cos x + \sin x}{\cos x}}{\frac{\sin x}{\cos x}\left(\frac{1+\cos x}{\sin x}\right)} \rightarrow \dfrac{\frac{\sin x(\cos x+1)}{\cos x}}{\frac{1+\cos x}{\cos x}}$

$\dfrac{\sin x(\cos x+1)}{\cos x}\cdot\dfrac{\cos x}{1+\cos x}$

$= \boxed{\sin x}$