Analysis CP- Unit 4
WS 1 Trig Identities - Algebra Review

Section A: *Factor the following completely.*

1. $x^2 - x - 6$
2. $\sin^2 x - \sin x - 6$
3. $x^2 + 2xy + y^2$
4. $\sin^2 x + 2\sin x \cdot \cos x + \cos^2 x$
5. $x^4 - y^4$
6. $\sin^4 x - \cos^4 x$
7. $x^3 + y^3$
8. $\sin^3 x + \cos^3 x$
9. $x^2 + xy$
10. $\sin^2 x + \sin x \cdot \cos x$
11. $xy^2 - x$
12. $\cos x \cdot \sin^2 x - \cos x$

Section B: *Simplify the following completely.*

13. $\dfrac{x^2 - y^2}{x + y}$
14. $\dfrac{\tan^2 x - \sec^2 x}{\tan x + \sec x}$
15. $\dfrac{1}{x} + \dfrac{1}{y}$
16. $\dfrac{1}{\sin x} + \dfrac{1}{\cos x}$
17. $\dfrac{x}{y} + \dfrac{y}{x}$
18. $\dfrac{\cos x}{\sin x} + \dfrac{\sin x}{\cos x}$
19. $\dfrac{1}{x} - x$
20. $\dfrac{1}{\sin x} - \sin x$
21. $x + \dfrac{1}{x}$
22. $\tan x + \dfrac{1}{\tan x}$
23. $\dfrac{\dfrac{x}{x - y}}{\dfrac{x^2 - xy}{3x}}$
24. $\dfrac{\dfrac{\tan x}{\sin x - \cos x}}{\dfrac{\sin^2 x - \sin x \cdot \cos x}{\cos x}}$

Section C: *Complete the square.*

25. $1 + 2x + \_\_\_ = (\_\_\_\_\_)^2$
27. $1 + 2\sin x + \_\_\_ = (\_\_\_\_\_)^2$

Section D: *Simplify the left side until it equals the right side.*

26. $\dfrac{y}{x} + \dfrac{x}{y} = (xy)^{-1}\left(x^2 + y^2\right)$
28. $\dfrac{\sin x}{\cos x} + \dfrac{\cos x}{\sin x} = (\sin x \cdot \cos x)^{-1}\left(\sin^2 x + \cos^2 x\right)$

Analysis CP- Unit 4
WS 2 Trig Identities - Simplifying

Completely simplify each problem. The answer to each problem will be one of the following: $\sin x$, $\cos x$, $\tan x$, or 1.

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

Analysis CP- Unit 4
WS 3 Trig Identities- Proofs

Prove the following. Use a two-column format, showing all work.

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

Analysis CP- Unit 4
WS 4 Trig Identities - Proving Trig Identities Extra Practice

Section A: *Use a two-column format, showing all work.*

1. $\tan\alpha = \sin\alpha \cdot \sec\alpha$
2. $\cot\beta = \cos\beta \cdot \csc\beta$
3. $\cot^2\alpha = \csc^2\alpha - 1$
4. $\tan\alpha + \cot\alpha = \sec\alpha \cdot \csc\alpha$
5. $\csc\theta = \dfrac{\cot\theta}{\cos\theta}$
6. $\sec^2\theta = \dfrac{\sin^2\theta + \cos^2\theta}{\cos^2\theta}$
7. $\csc^4\theta - \cot^4\theta = \csc^2\theta + \cot^2\theta$
8. $\sec^4\theta - \tan^4\theta = \tan^2\theta + \sec^2\theta$
9. $(1-\tan\theta)^2 = \sec^2\theta - 2\tan\theta$
10. $(1-\sin^2\alpha)(1+\tan^2\alpha) = 1$
11. $\dfrac{\cos^2\beta}{\sin\beta} + \sin\beta = \csc\beta$
12. $\tan^2\theta = \dfrac{1-\cos^2\theta}{\cos^2\theta}$
13. $\dfrac{\tan x}{1-\cos^2 x} = \sec x \cdot \csc x$
14. $\dfrac{\cot\beta}{\cos\beta} + \dfrac{\sec\beta}{\cot\beta} = \sec^2\beta \cdot \csc\beta$
15. $2\sin^2\alpha - 1 + 2\cos^2\alpha = 1$

Section B: *Use a two-column format, showing all work.*

16. $1 - \dfrac{\cos\alpha - \sin\alpha}{\cos\alpha} = \tan\alpha$
17. $\dfrac{1+\sin x - \sin^2 x}{\cos x} - \cos x = \tan x$
18. $\tan\beta(\tan\beta + \cot\beta) = \sec^2\beta$
19. $(\sec\alpha - \tan\alpha)(\sec\alpha + \tan\alpha) = 1$
20. $\dfrac{(\cos\theta+1)(1-\cos\theta)}{\sin^3\theta} = \csc\theta$
21. $\dfrac{\sin\alpha}{1-\cos\alpha} - \cot\alpha = \csc\alpha$
22. $\dfrac{\tan\beta}{\sec\beta} + \dfrac{\cot\beta}{\csc\beta} = \sin\beta + \cos\beta$
23. $\dfrac{\sin x}{\csc x - 1} + \dfrac{\sin x}{\csc x + 1} = 2\tan^2 x$
24. $\dfrac{(1-2\sin x - 3\sin^2 x)(1-\sin x)}{1-3\sin x} = \cos^2 x$
25. $\dfrac{\sin^3\alpha + \cos^3\alpha}{1-2\cos^2\alpha} - \dfrac{\sec\alpha - \sin\alpha}{\tan\alpha - 1} = 0$

Analysis CP- Unit 4
WS 5 Trig Identities - Sum, Difference, and Double Angle Identities

Section A: *Simplify the following*.

1. $\cos(270° + x)$
2. $\dfrac{1-\cos(2\theta)}{\sin(2\theta)}$
3. $\tan(45° + x)$
4. $\sec(270° + \alpha)$

Section B: *Prove each of the following*.

5. $\dfrac{2\csc(2\beta)}{\sec\beta} = \csc\beta$
6. $\dfrac{1}{2}(\tan\theta)(\sin 2\theta) = 1 - \cos^2\theta$
7. $\sin(30° + y) + \cos(60° + y) = \cos y$
8. $\cot\alpha = \csc(2\alpha) + \cot(2\alpha)$
9. $(\sin\theta - \cos\theta)^2 + \sin(2\theta) = 1$
10. $\tan(135° + x) = \dfrac{\tan x - 1}{\tan x + 1}$

Analysis CP- Unit 4
WS 6 Trig Identities - Review

Prove each problem is an identity. Use a two-column format, showing all work.

1. $(\sec x)(\sin x) = \tan x$
2. $\sin x + (\cos x)(\cot x) = \csc x$
3. $(\cos x)(\csc x) = \cot x$
4. $\tan x\left[\sin x + (\cot x)(\cos x)\right] = \sec x$
5. $\sec^2 x\left(1 - \sin^2 x\right) = 1$
6. $2\cos^2 x - \sin^2 x + 1 = 3\cos^2 x$
7. $\csc^2 x\left(1 - \cos^2 x\right) = 1$
8. $(\sin x)(\tan x) + \cos x = \sec x$
9. $\sin x(\sec x - \csc x) = \tan x - 1$
10. $\cos^2 x\left(1 + \tan^2 x\right) = 1$
11. $\cos x(\csc x - \sec x) = \cot x - 1$
12. $\sec x - \cos x = (\sin x)(\tan x)$
13. $\dfrac{(\sin x)(\cot x) + \cos x}{\sin x} = 2\cot x$
14. $\dfrac{1 + (2\sin x)(\cos x)}{\sin x + \cos x} = \sin x + \cos x$
15. $\dfrac{1 + \tan^2 x}{\tan^2 x} = \csc^2 x$
16. $\cos^4 x - \sin^4 x = \cos^2 x - \sin^2 x$
17. $\dfrac{1 - \sin^2 x}{1 - \cos^2 x} = \cot^2 x$
18. $\dfrac{1 - \sin x}{\cos x} = \dfrac{\cos x}{1 + \sin x}$
19. $\cos(60° + A) = \sin(30° - A)$
20. $\tan(x + 45°) = \dfrac{1 + \tan x}{1 - \tan x}$
21. $\csc 2\theta = \dfrac{1}{2}(\sec\theta \cdot \csc\theta)$
22. $\cos x - 1 = \dfrac{\cos 2x - 1}{2(\cos x + 1)}$
23. $\cos A - \sin A = \dfrac{\cos 2A}{\cos A + \sin A}$
24. $1 + \dfrac{1}{2}\sin 2A = \dfrac{\sec A + \sin A}{\sec A}$