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MHF4U1 - UNIT 7 – TRIGONOMETRIC IDENTITIES AND EQUATIONS

TEST

1. Express $\frac{2 \tan\left(\frac{\theta}{2}\right)}{1 - \tan^2\left(\frac{\theta}{2}\right)}$ as a **single** trigonometric function. Simplify as much as possible. (*K - 2 marks*)

2. Simplify $\sin\left(\frac{\pi}{2} - x\right) + \sin(\pi + x) + \sin\left(\frac{3\pi}{2} + x\right) + \sin(2\pi - x)$. (*K - 3 marks*)

3. Determine the exact value of the trigonometric ratio $\sin\frac{5\pi}{12}$. Rationalize the denominator.
(*K - 3 marks*)

4. If $\tan x = -\frac{3}{4}$ and $\frac{3\pi}{2} \leq x \leq 2\pi$, determine the exact value of $\sin 4x$. (*K - 4 marks*)

5. Determine the solutions for each equation on the interval $0 \leq x \leq 2\pi$. Give exact solutions, where possible. Round approximate solutions to the nearest hundredth of a radian. (A - 3 marks each)

a) $-5 \cos x + 3 = 2$

b) $2 \sin 3x + \sqrt{3} = 0$

c) $\sin x + \sin x \tan x = 0$

d) $\cos 2x - 3 = 5 \cos x - 4 \cos^2 x$

6. Prove the following identities. (1 - 4 marks each)

a)
$$\frac{\sin 2x + \sin x}{1 + \cos x + \cos 2x} = \cot\left(\frac{\pi}{2} - x\right)$$

b)
$$(\sec x - \cos x)(\csc x - \sin x) = \frac{\tan x}{1 + \tan^2 x}$$

7. Determine the exact value of $\tan \frac{\pi}{8}$. **Show all work and simplify your answer as much as possible.**

(I - 4 marks)

8. Solve $\csc \theta = 2.7451$ for $-720^\circ \leq \theta \leq 720^\circ$. Round your answers to the nearest tenth of a degree.

(C - 3 marks)

9. Using other identities, develop the tangent subtraction formula $\tan(x - y) = \frac{\tan x - \tan y}{1 + \tan x \tan y}$.

(C - 3 marks)