Worksheet on product–sum and sum–product identities

Name_____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Express the product as a sum containing only sines or cosines.

1) $\sin(5\theta)\sin(3\theta)$ 1) _____

2) $\cos\frac{9\theta}{2}\cos\frac{\theta}{2}$ 2) _____

Complete the identity.

3) $\sin\theta\,[\sin(4\theta) + \sin 6\theta)] = ?$ 3) _____

Express the sum or difference as a product of sines and/or cosines.

4) $\cos(8\theta) - \cos(4\theta)$ 4) _____

5) $\sin(6\theta) - \sin(2\theta)$ 5) _____

Establish the identity.

6) $\frac{\cos(9\theta) - \cos(3\theta)}{2\sin(6\theta)} = -\sin(3\theta)$ 6) _____

7) $\frac{\cos\alpha + \cos\beta}{\sin\alpha - \sin\beta} = \cot\frac{\alpha - \beta}{2}$ 7) _____

Complete the identity.

8) $1 - \cos(2\theta) + \cos(6\theta) - \cos(8\theta) = ?$ 8) _____

1) $\frac{1}{2}[\cos(2\theta) - \cos(8\theta)]$

2) $\frac{1}{2}[\cos(4\theta) + \cos(5\theta)]$

3) $\cos\theta\,[\cos(4\theta) - \cos(6\theta)]$

4) $-2\sin(6\theta)\sin(2\theta)$

5) $2\sin(2\theta)\cos(4\theta)$

6) $\frac{\cos(9\theta) - \cos(3\theta)}{2\sin(6\theta)} = \frac{-2\sin(6\theta)\sin(3\theta)}{2\sin(6\theta)} = -\sin(3\theta)$

7) $\frac{\cos\alpha + \cos\beta}{\sin\alpha - \sin\beta} = \frac{2\cos\frac{\alpha+\beta}{2}\cos\frac{\alpha-\beta}{2}}{2\sin\frac{\alpha-\beta}{2}\cos\frac{\alpha+\beta}{2}} = \frac{\cos\frac{\alpha-\beta}{2}}{\sin\frac{\alpha-\beta}{2}} = \cot\frac{\alpha-\beta}{2}$

8) $4\sin\theta\cos(3\theta)\sin(4\theta)$