

Warm-Up

Simplify: $\frac{\csc \theta \cot^2 \theta + \csc \theta}{\cot \theta \sec \theta}$

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Simplify: $\frac{\csc \theta \cot^2 \theta + \csc \theta}{\cot \theta \sec \theta} = \csc^2 \theta$

10-1 NOTES: (PART 2 SUM-TO-PRODUCT FORMULAS)

FORMULAS FOR $\cos(\alpha \pm \beta)$ AND $\sin(\alpha \pm \beta)$

Learning Targets:

- I can apply formulas for $\cos(\alpha \pm \beta)$ and $\sin(\alpha \pm \beta)$

SUM-TO-PRODUCT FORMULAS

$$\sin x + \sin y = 2 \sin \left(\frac{x + y}{2} \right) \cos \left(\frac{x - y}{2} \right)$$

$$\sin x - \sin y = 2 \cos \left(\frac{x + y}{2} \right) \sin \left(\frac{x - y}{2} \right)$$

$$\cos x + \cos y = 2 \cos \left(\frac{x + y}{2} \right) \cos \left(\frac{x - y}{2} \right)$$

$$\cos x - \cos y = -2 \sin \left(\frac{x + y}{2} \right) \sin \left(\frac{x - y}{2} \right)$$

EXAMPLES: WRITE EACH SUM OR DIFFERENCE AS A PRODUCT

$$\begin{aligned} 1) \cos 163 - \cos 33 &= -2 \sin \frac{163 + 33}{2} \sin \frac{163 - 33}{2} \\ &= -2 \sin 98 \sin 65 \end{aligned}$$

$$\begin{aligned} 2) 3\cos 92 + 3\cos 84 &= 2(3) \cos \frac{92 + 84}{2} \cos \frac{92 - 84}{2} \\ &= 6 \cos 88 \cos 4 \end{aligned}$$

PRODUCT-TO-SUM FORMULAS

$$\sin x \sin y = \frac{1}{2} [\cos(x - y) - \cos(x + y)]$$

$$\cos x \cos y = \frac{1}{2} [\cos(x - y) + \cos(x + y)]$$

$$\sin x \cos y = \frac{1}{2} [\sin(x + y) + \sin(x - y)]$$

$$\cos x \sin y = \frac{1}{2} [\sin(x + y) - \sin(x - y)]$$

EXAMPLES: WRITE EACH PRODUCT AS A SUM OR DIFFERENCE

1) $2 \sin 92 \cos 52$

$$2 \sin 92 \cos 52 = 2 * \frac{1}{2} [\sin(92 + 52) + \sin(92 - 52)]$$

$$= \sin 144 + \sin 40$$

EXAMPLES: WRITE EACH PRODUCT AS A SUM OR DIFFERENCE

2) $-3 \cos 81 \cos 67$

$$-3 \cos 81 \cos 67 = -3 * \frac{1}{2} [\cos(81 - 67) + \cos(81 + 67)]$$

$$= -\frac{3}{2} \cos 148 + \cos 14$$

Write each sum or difference as a product.

1) $\cos 202 + \cos 36$

2) $5\sin 285 + 5\sin 23$

Write each product as a sum or difference.

3) $2\sin 59\sin 54$

4) $\cos 86\cos 52$

Write each sum or difference as a product.

1) $\cos 202 + \cos 36$

$$2\cos 119\cos 83$$

2) $5\sin 285 + 5\sin 23$

$$10\sin 154\cos 131$$

Write each product as a sum or difference.

3) $2\sin 59\sin 54 - (\cos 113 - \cos 5)$

$$= \cos 5 - \cos 113$$

4) $\cos 86\cos 52$

$$\frac{1}{2}(\cos 138 + \cos 34)$$