Product-to-Sum Formulas

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

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

3) $\cos u \cos v = \frac{1}{2}[\cos(u + v) + \cos(u - v)]$

4) $\sin u \sin v = \frac{1}{2}[\cos(u - v) - \cos(u + v)]$

54. $3 \cos 37.5° \cos 7.5° = \frac{3}{2}\left(\cos 45° + \cos 30°\right)$

$= \frac{3}{2}\left(\frac{\sqrt{2}}{2} + \frac{\sqrt{3}}{2}\right) = \frac{3(\sqrt{2}+\sqrt{3})}{4}$

$\cos A \cos B = \frac{1}{2}\left(\cos(A+B) + \cos(A-B)\right)$

Sum-to-Product Formulas

$$\sin x + \sin y = 2 \sin \frac{x+y}{2 \text{ A}} \cos \frac{x-y}{2} \text{ B}$$

$$\sin x - \sin y = 2 \cos \frac{x+y}{2} \sin \frac{x-y}{2}$$

$$\cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2}$$

$$\cos x - \cos y = -2 \sin \frac{x+y}{2} \sin \frac{x-y}{2}$$

$$2 \sin A \cos B$$

$$2 \left(\frac{1}{2} \left[\sin(A+B) + \sin(A-B) \right] \right)$$

$$= \sin(A+B) + \sin(A-B)$$

$$\sin x + \sin y$$