SEC 3.4 SUM-TO-PRODUCT IDENTITIES
PRODUCT-TO-SUM IDENTITIES

1. SUM-TO-PRODUCT

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

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

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

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

2. PRODUCT-TO-SUM

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

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

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

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

H.W. #1 $2 \sin x \cdot \cos 2x$

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

$$\left[\sin 3x + \sin(-x)\right]$$

$$\boxed{\sin 3x - \sin x}$$