

## 6.6 Product to Sum & Sum to Product formulas

Product to Sum Formulas: proofs on p. 504

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

$$(2) \cos \alpha \cos \beta = \frac{1}{2} [\cos (\alpha - \beta) + \cos (\alpha + \beta)]$$

$$(3) \sin \alpha \cos \beta = \frac{1}{2} [\sin (\alpha + \beta) + \sin (\alpha - \beta)]$$

Ex. 1 Express each of the following products as a sum containing only sines and cosines.

a)  $\sin (6\theta) \sin (4\theta)$

b)  $\cos (3\theta) \cos \theta$

c)  $\sin (3\theta) \cos (5\theta)$

Sum to Product Formulas (we will finish in class)

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

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

$$\cos \alpha + \cos \beta = 2 \cos \frac{\alpha + \beta}{2} \cos \frac{\alpha - \beta}{2}$$

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

Ex. 2 Express each sum or difference as a product of sines and / or cosines.

a)  $\sin (5\theta) - \sin 3\theta$

b)  $\cos (3\theta) + \cos (2\theta)$