Student: ____________ **Date:** ____________	**Instructor:** Joe Betters **Course:** Pre-Calculus Pre AP (Master Course)	**Assignment:** 7.7 CW Day 2

1. Find the exact value of the expression $\cos 180^\circ - \cos 120^\circ$.

   The exact value of the expression is ____________.
   (Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression.)

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

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

   $\cos(3\theta)\cos(5\theta) =$ ____________
   (Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression.)

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

   $\cos 2\theta + \cos 6\theta$

   $\cos 2\theta + \cos 6\theta =$ ____________
   (Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression.)

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

   $\cos\frac{\theta}{2} - \cos\frac{3\theta}{2}$

   $\cos\frac{\theta}{2} - \cos\frac{3\theta}{2} =$ ____________
   (Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression.)

5. Derive the Product-to-Sum formula $\sin \alpha \cos \beta = \frac{1}{2}[\sin(\alpha + \beta) + \sin(\alpha - \beta)]$.

First, rewrite the term $\sin(\alpha + \beta)$, using the Sum Formula for the sine function.

$\sin(\alpha + \beta) =$ __________

Now, rewrite the term $\sin(\alpha - \beta)$, using the Difference Formula for the sine function.

$\sin(\alpha - \beta) =$ __________

Next, substitute the resulting expressions into the expression $\frac{1}{2}[\sin(\alpha + \beta) + \sin(\alpha - \beta)]$, for $\sin(\alpha + \beta)$ and $\sin(\alpha - \beta)$ respectively, and then simplify.

$\frac{1}{2}[\sin(\alpha + \beta) + \sin(\alpha - \beta)] = \frac{1}{2}[\quad\quad\quad]$ (Simplify your answer.)

$\frac{1}{2}[\sin(\alpha + \beta) + \sin(\alpha - \beta)] =$ __________ (Simplify your answer.)

Therefore, the resulting formula is shown below.

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

1. $-\frac{1}{2}$

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

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3. $2\cos(4\theta)\cos(2\theta)$

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4. $2\sin\theta\sin\frac{\theta}{2}$

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5. $\sin\alpha\cos\beta + \cos\alpha\sin\beta$

   $\sin\alpha\cos\beta - \cos\alpha\sin\beta$

   $2\sin\alpha\cos\beta$

   $\sin\alpha\cos\beta$

7.7 classwork day 2

① $\cos 180^\circ - \cos 120^\circ$

$$-2\sin\left(\frac{180^\circ + 120^\circ}{2}\right)\sin\left(\frac{180^\circ - 120^\circ}{2}\right)$$

$$-2\sin 150^\circ \sin 30^\circ$$

$$-2\left(\tfrac{1}{2}\right)\left(\tfrac{1}{2}\right)$$

$$\boxed{-\tfrac{1}{2}}$$

② $\cos 3\theta \cos 5\theta$

$$\frac{\cos(3\theta + 5\theta) + \cos(3\theta - 5\theta)}{2}$$

$$\frac{\cos 8\theta + \cos(-2\theta)}{2}$$

$$\boxed{\tfrac{1}{2}\left(\cos 8\theta + \cos 2\theta\right)}$$

7.7 classwork day 2 continued

③ $\cos 2\theta + \cos 6\theta$

$$2\cos\frac{2\theta+6\theta}{2}\cos\frac{2\theta-6\theta}{2}$$

$$2\cos(4\theta)\cos(-2\theta)$$

$$\boxed{2\cos 4\theta \cos 2\theta}$$

④ $\cos\frac{\theta}{2} - \cos\frac{3\theta}{2}$

$$-2\sin\left(\frac{\frac{\theta}{2}+\frac{3\theta}{2}}{2}\right)\sin\left(\frac{\frac{\theta}{2}-\frac{3\theta}{2}}{2}\right)$$

$$-2\sin\theta\sin\left(-\frac{\theta}{2}\right)$$

$$\boxed{2\sin\theta\sin\frac{\theta}{2}}$$

7.7 classwork day 2 continued

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

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

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

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

$\frac{1}{2}\left[2 \sin A \cos B\right]$

$\boxed{\sin A \cos B}$