Calculus 12
10-3 Addition and Subtraction Formulas

1. Express as a single trigonometric function.

a) $\cos 2a \cos a - \sin 2a \sin a$

b) $\cos x \cos 4x + \sin x \sin 4x$

c) $\sin 5 \cos 2 - \cos 5 \sin 2$

d) $\dfrac{\tan 2a + \tan 3a}{1 - \tan 2a \tan 3a}$

2. Evaluate using the formulas developed in this section.

a) $\sin \dfrac{11\pi}{12}$

b) $\cos\left(\dfrac{13\pi}{12}\right)$

c) $\tan\left(-\dfrac{7}{12}\pi\right)$

3. Find the value of each of the following.

a) $\sin\left(\dfrac{\pi}{4} - \dfrac{\pi}{3}\right)$

b) $\cos\left(-\dfrac{\pi}{6} - \dfrac{\pi}{4}\right)$

c) $\tan\left(-\dfrac{3\pi}{4} + \dfrac{2\pi}{3}\right)$

4. If x and y are in the interval $\left(0, \dfrac{\pi}{2}\right)$ and $\sin x = \dfrac{3}{5}$ and $\cos y = \dfrac{12}{13}$, evaluate each of the following.

a) $\sin(x - y)$

b) $\cos(x + y)$

5. If x is in the interval $\left(\dfrac{\pi}{2}, \pi\right)$ and y is in the interval $\left(\pi, \dfrac{3\pi}{2}\right)$ and $\cos x = -\dfrac{5}{13}$ and $\tan y = \dfrac{4}{3}$, evaluate each of the following.

a) $\sin(x + y)$

b) $\tan(x - y)$

6. Find the exact value of each of the following.

a) $\sin 50^\circ \cos 20^\circ - \cos 50^\circ \sin 20^\circ$

b) $\sin \dfrac{5\pi}{36} \cos \dfrac{5\pi}{18} + \cos \dfrac{5\pi}{36} \sin \dfrac{5\pi}{18}$

7. Simplify.

a) Use the Addition Formula for Sine to prove the Subtraction Formula for Sine, namely, $\sin(a - b) = \sin a \cos b - \cos a \sin b$.

8. Use the identity $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$ to prove the Subtraction Formula for Tangent, namely $\tan(a-b) = \dfrac{\tan a - \tan b}{1 + \tan a \tan b}$.

9. Prove each of the following.

a) $\cos\left(\dfrac{3\pi}{2} + x\right) = \sin x$

b) $\tan(2\pi - x) = -\tan x$

c) $\tan\left(\dfrac{\pi}{2} + x\right) = -\cot x$

d) $-\tan(-x - \pi) = \tan x$