

Name: _____

Sum and Difference Formulas

Use a sum or difference identity to find the exact value. Check each answer with your calculator.

1. $\sin 15^\circ$ $\sin(45^\circ - 30^\circ)$

$$\frac{\sqrt{6} - \sqrt{2}}{4}$$

2. $\tan 15^\circ$ $\tan(45^\circ - 30^\circ)$

$$2 - \sqrt{3}$$

3. $\sin 75^\circ$ $\sin(45^\circ + 30^\circ)$

$$\frac{\sqrt{6} + \sqrt{2}}{4}$$

4. $\cos 75^\circ$ $\cos(45^\circ + 30^\circ)$

$$\frac{\sqrt{6} - \sqrt{2}}{4}$$

5. $\cos \frac{\pi}{12}$ $\cos(\frac{\pi}{4} - \frac{\pi}{6})$

$$\frac{\sqrt{6} + \sqrt{2}}{4}$$

6. $\sin \frac{7\pi}{12}$ $\sin(60^\circ + 45^\circ)$

$$\frac{\sqrt{6} + \sqrt{2}}{4}$$

7. $\tan \frac{5\pi}{12}$ $\tan(45^\circ + 30^\circ)$

$$2 + \sqrt{3}$$

8. $\tan \frac{11\pi}{12}$ $\tan(120^\circ + 45^\circ)$

$$-2 + \sqrt{3}$$

$$9. \cos \frac{7\pi}{12} = \frac{\sqrt{2} - \sqrt{6}}{4}$$

$$10. \sin \frac{-\pi}{12} = \frac{\sqrt{2} - \sqrt{6}}{4}$$

Prove each of the following.

$$11. \sin(\alpha + \beta) + \sin(\alpha - \beta) = 2 \sin \alpha \cos \beta$$

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

$$12. \frac{\sin(\alpha + \beta)}{\sin \alpha \cos \beta} = 1 + \cot \alpha \tan \beta$$

$$\frac{\sin \alpha \cos \beta + \cancel{\cos \alpha \sin \beta}}{\sin \alpha \cos \beta} = \frac{\cancel{\sin \alpha \cos \beta}}{\cancel{\sin \alpha \cos \beta}} + \frac{\cos \alpha \sin \beta}{\sin \alpha} = 1 + \cot \alpha \tan \beta$$

$$13. \frac{\cos(\alpha + \beta)}{\cos \alpha \cos \beta} = 1 - \tan \alpha \tan \beta$$

$$\frac{\cos \alpha \cos \beta - \cancel{\sin \alpha \sin \beta}}{\cos \alpha \cos \beta}$$

For #'s 14 - 16, given: $\csc \alpha = \frac{13}{5}$, $\frac{\pi}{2} \leq \alpha \leq \pi$, and $\tan \beta = -\frac{3}{4}$, $\frac{3\pi}{2} \leq \beta \leq 2\pi$, find the following:

$$\sin \alpha = \frac{5}{13}$$

$$14. \sin(\alpha - \beta)$$

$$-16/65$$

$$15. \cos(\beta + \alpha)$$

$$-33/65$$

$$16. \tan(\alpha - \beta)$$

$$16/63$$