

Topics: sum and difference formulas

Student Learning Outcomes:

1. Students will be able apply the sum and difference formulas for sine and cosine.
 2. Students will be able to apply the sum and difference formulas for tangent.
 3. Students will be able to use sum and difference formulas to verify identities.
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1 Apply the Sum and Difference Formulas

Sum and Difference Identities

$$\sin(u + v) = \sin u \cos v + \cos u \sin v$$

$$\sin(u - v) = \sin u \cos v - \cos u \sin v$$

$$\cos(u + v) = \cos u \cos v - \sin u \sin v$$

$$\cos(u - v) = \cos u \cos v + \sin u \sin v$$

$$\tan(u + v) = \frac{\tan u + \tan v}{1 - \tan u \tan v}$$

$$\tan(u - v) = \frac{\tan u - \tan v}{1 - \tan u \tan v}$$

1. Evaluate each of the following using the above identities and the unit circle.

(a) $\cos 15^\circ$

(b) $\sin \frac{5\pi}{12}$

(c) $\sin 25^\circ \cos 35^\circ + \cos 25^\circ \sin 35^\circ$

(d) $\tan 75^\circ$

(e) $\sin \frac{\pi}{12}$

(f) $\cos 99^\circ \cos 36^\circ - \sin 99^\circ \sin 36^\circ$

2. Find the exact value of $\sin(\alpha + \beta)$ given that $\sin \alpha = \frac{5}{13}$ and $\cos \beta = \frac{5}{6}$ for α in Quadrant II and β in Quadrant IV.

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

$$\sin \left(\arctan \left(-\frac{9}{4} \right) + \arccos \left(\frac{8}{17} \right) \right)$$

2 Use Sum and Difference Formulas to Verify Identities

4. Prove that each of the following is an identity.

(a) $\sin\left(\frac{\pi}{2} - x\right) = \cos x$

(b) $\sin(x + y) - \sin(x - y) = 2 \cos x \sin y$

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

Student Learning Outcomes Check

1. Can you apply the sum and difference formulas for sine and cosine?
2. Can you apply the sum and difference formulas for tangent?
3. Are you able to use sum and difference formulas to verify identities?

If any of your answers were no, please ask about these topics in class.