

Unit 4.4 Sum and Difference Identities (Tangent) PRACTICE

Simplify.

1)
$$\frac{\tan 6\theta - \tan -4\theta}{1 + \tan 6\theta \tan -4\theta}$$

$$\tan 10\theta$$

2)
$$\frac{\tan 4\theta + \tan 6\theta}{1 - \tan 4\theta \tan 6\theta}$$

$$\tan 10\theta$$

3)
$$\frac{\tan -5\theta - \tan 3\theta}{1 + \tan -5\theta \tan 3\theta}$$

$$\tan -8\theta$$

4)
$$\frac{\tan -v - \tan 6v}{1 + \tan -v \tan 6v}$$

$$\tan -7v$$

5)
$$\frac{\tan -5u - \tan -2u}{1 + \tan -5u \tan -2u}$$

$$\tan -3u$$

6)
$$\frac{\tan u + \tan 4u}{1 - \tan u \tan 4u}$$

$$\tan 5u$$

7)
$$\frac{\tan -3\theta - \tan -\theta}{1 + \tan -3\theta \tan -\theta}$$

$$\tan -2\theta$$

8)
$$\frac{\tan -3x + \tan -x}{1 - \tan -3x \tan -x}$$

$$\tan -4x$$

Verify each identity.

$$9) \tan(180^\circ - \theta) = -\tan \theta$$

$$\begin{aligned} & \tan(180^\circ - \theta) \\ &= \frac{\tan 180^\circ - \tan \theta}{1 + \tan 180^\circ \tan \theta} \\ &= \frac{0 - \tan \theta}{1 + 0 \tan \theta} \\ &= -\tan \theta \end{aligned}$$

$$10) \tan(\theta + 45^\circ) = \frac{\tan \theta + 1}{1 - \tan \theta}$$

$$\begin{aligned} & \tan(\theta + 45^\circ) \\ &= \frac{\tan \theta + \tan 45^\circ}{1 - \tan \theta \tan 45^\circ} \\ &= \frac{\tan \theta + 1}{1 - \tan \theta \cdot 1} \\ &= \frac{\tan \theta + 1}{1 - \tan \theta} \end{aligned}$$

$$11) \tan\left(\frac{\pi}{4} - \theta\right) = \frac{1 - \tan \theta}{1 + \tan \theta}$$

$$\begin{aligned} & \tan\left(\frac{\pi}{4} - \theta\right) \\ &= \frac{\tan \frac{\pi}{4} - \tan \theta}{1 + \tan \frac{\pi}{4} \tan \theta} \\ &= \frac{1 - \tan \theta}{1 + \tan \theta} \\ &= \frac{1 - \tan \theta}{1 + \tan \theta} \end{aligned}$$

$$12) \tan(\theta - \pi) = \tan \theta$$

$$\begin{aligned} & \tan(\theta - \pi) \\ &= \frac{\tan \theta - \tan \pi}{1 + \tan \theta \tan \pi} \\ &= \frac{\tan \theta - 0}{1 + \tan \theta \cdot 0} \\ &= \tan \theta \end{aligned}$$

$$13) \tan(135^\circ + \theta) = \frac{-1 + \tan \theta}{1 + \tan \theta}$$

$$\begin{aligned} & \tan(135^\circ + \theta) \\ &= \frac{\tan 135^\circ + \tan \theta}{1 - \tan 135^\circ \tan \theta} \\ &= \frac{-1 + \tan \theta}{1 - (-1) \tan \theta} \\ &= \frac{-1 + \tan \theta}{1 + \tan \theta} \end{aligned}$$

$$14) \tan\left(\theta - \frac{3\pi}{4}\right) = \frac{\tan \theta + 1}{1 - \tan \theta}$$

$$\begin{aligned} & \tan\left(\theta - \frac{3\pi}{4}\right) \\ &= \frac{\tan \theta - \tan \frac{3\pi}{4}}{1 + \tan \theta \tan \frac{3\pi}{4}} \\ &= \frac{\tan \theta - (-1)}{1 + \tan \theta \cdot (-1)} \\ &= \frac{\tan \theta + 1}{1 - \tan \theta} \end{aligned}$$

$$15) \tan\left(\frac{3\pi}{4} - \theta\right) = \frac{-1 - \tan \theta}{1 - \tan \theta}$$

$$\begin{aligned} & \tan\left(\frac{3\pi}{4} - \theta\right) \\ &= \frac{\tan \frac{3\pi}{4} - \tan \theta}{1 + \tan \frac{3\pi}{4} \tan \theta} \\ &= \frac{-1 - \tan \theta}{1 - \tan \theta} \\ &= \frac{-1 - \tan \theta}{1 - \tan \theta} \end{aligned}$$

$$16) \tan(\theta + 180^\circ) = \tan \theta$$

$$\begin{aligned} & \tan(\theta + 180^\circ) \\ &= \frac{\tan \theta + \tan 180^\circ}{1 - \tan \theta \tan 180^\circ} \\ &= \frac{\tan \theta + 0}{1 - \tan \theta \cdot 0} \\ &= \tan \theta \end{aligned}$$