

Name _____

Date _____

Sum and Difference Identities

Find the exact value of each.

1) $\sin -15$

2) $\sin 165$

3) $\cos \frac{17\pi}{12}$

4) $\cos -105$

5) $\tan 105$

6) $\tan \frac{5\pi}{12}$

7) $\frac{\tan \frac{8\pi}{9} - \tan \frac{\pi}{18}}{1 + \tan \frac{8\pi}{9} \tan \frac{\pi}{18}}$

8) $\cos 10\cos 35 - \sin 10\sin 35$

9) $\frac{\tan 76 + \tan 164}{1 - \tan 76 \tan 164}$

10) $\sin \frac{\pi}{9} \cos \frac{2\pi}{9} + \cos \frac{\pi}{9} \sin \frac{2\pi}{9}$

Simplify.

11) $\sin -6\theta \cos 4\theta + \cos -6\theta \sin 4\theta$

12) $\sin \theta \cos 3\theta + \cos \theta \sin 3\theta$

13) $\cos 3x \cos -4x + \sin 3x \sin -4x$

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

Write each trigonometric expression as an algebraic expression.

15) $\sin\left(\cos^{-1} \frac{\sqrt{2}}{2} - \sin^{-1} 2x\right)$

16) $\sin(\cos^{-1} 4x + \cos^{-1} x)$

17) $\cos(\tan^{-1} 2x + \sin^{-1} 0)$

18) $\tan(\tan^{-1} 1 - \tan^{-1} \sqrt{x})$

Verify each identity.

19) $\sin\left(\frac{\pi}{2} + \theta\right) = \cos \theta$

20) $\cos(\pi + \theta) = -\cos \theta$

ANSWERS**Find the exact value of each.**

1) $\sin -15$

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

2) $\sin 165$

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

3) $\cos \frac{17\pi}{12}$

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

4) $\cos -105$

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

5) $\tan 105$

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

6) $\tan \frac{5\pi}{12}$

$$2 + \sqrt{3}$$

7)
$$\frac{\tan \frac{8\pi}{9} - \tan \frac{\pi}{18}}{1 + \tan \frac{8\pi}{9} \tan \frac{\pi}{18}}$$

$$-\frac{\sqrt{3}}{3}$$

8) $\cos 10\cos 35 - \sin 10\sin 35$

$$\frac{\sqrt{2}}{2}$$

9)
$$\frac{\tan 76 + \tan 164}{1 - \tan 76 \tan 164}$$

$$\sqrt{3}$$

10)
$$\sin \frac{\pi}{9} \cos \frac{2\pi}{9} + \cos \frac{\pi}{9} \sin \frac{2\pi}{9}$$

$$\frac{\sqrt{3}}{2}$$

Simplify.

11) $\sin -6\theta \cos 4\theta + \cos -6\theta \sin 4\theta$

$$\sin -2\theta$$

12) $\sin \theta \cos 3\theta + \cos \theta \sin 3\theta$

$$\sin 4\theta$$

13) $\cos 3x \cos -4x + \sin 3x \sin -4x$

$$\cos 7x$$

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

$$\tan 5u$$

Write each trigonometric expression as an algebraic expression.

15) $\sin\left(\cos^{-1} \frac{\sqrt{2}}{2} - \sin^{-1} 2x\right)$
$$\frac{-2x\sqrt{2} + \sqrt{2-8x^2}}{2}$$

16) $\sin(\cos^{-1} 4x + \cos^{-1} x)$

$$4x^2 + \sqrt{1 - 17x^2 + 16x^4}$$

17) $\cos(\tan^{-1} 2x + \sin^{-1} 0)$
$$\frac{\sqrt{4x^2+1}}{4x^2+1}$$

18) $\tan(\tan^{-1} 1 - \tan^{-1} \sqrt{x})$

$$\frac{1-2\sqrt{x}+x}{1-x}$$

Verify each identity.

19) $\sin\left(\frac{\pi}{2} + \theta\right) = \cos \theta$

$$\begin{aligned} & \sin\left(\frac{\pi}{2} + \theta\right) \\ &= \sin \frac{\pi}{2} \cos \theta + \cos \frac{\pi}{2} \sin \theta \\ &= \cos \theta + 0 \sin \theta \\ &= \cos \theta \end{aligned}$$

20) $\cos(\pi + \theta) = -\cos \theta$

$$\begin{aligned} & \cos(\pi + \theta) \\ &= \cos \pi \cos \theta - \sin \pi \sin \theta \\ &= -\cos \theta - 0 \sin \theta \\ &= -\cos \theta \end{aligned}$$