

Double- and Half-Angle Identities

Use a double-angle identity to find the exact value of each expression.

1) $\sin 120^\circ$

2) $\tan 60^\circ$

3) $\cos \frac{4\pi}{3}$

4) $\sin \frac{5\pi}{3}$

Use a half-angle identity to find the exact value of each expression.

5) $\tan 45^\circ$

6) $\sin 165^\circ$

7) $\sin \frac{5\pi}{6}$

8) $\cos 30^\circ$

Use a double-angle or half-angle identity to find the exact value of each expression.

9) $\cot \frac{\pi}{3}$

10) $\cot \frac{2\pi}{3}$

11) $\sec \frac{5\pi}{12}$

12) $\cot 60^\circ$

13) $\cot 240^\circ$

14) $\cot \frac{5\pi}{3}$

15) $\sin \theta = -\frac{7}{25}$ and $270^\circ < \theta < 360^\circ$
Find $\cos \frac{\theta}{2}$

16) $\cos \theta = \frac{1}{3}$ and $0^\circ < \theta < 90^\circ$
Find $\sin 2\theta$

17) $\cos \theta = \frac{4}{5}$ and $270^\circ < \theta < 360^\circ$
Find $\sin 2\theta$

18) $\cos \theta = \frac{2\sqrt{5}}{5}$ and $0^\circ < \theta < 90^\circ$
Find $\sin \frac{\theta}{2}$

19) $\cos \theta = -\frac{4}{5}$ and $90^\circ < \theta < 180^\circ$
Find $\sin \frac{\theta}{2}$

20) $\cos \theta = -\frac{15}{17}$ and $180^\circ < \theta < 270^\circ$
Find $\tan \frac{\theta}{2}$

21) $\tan \theta = -\frac{7}{24}$ and $\frac{3\pi}{2} < \theta < 2\pi$
Find $\cot \frac{\theta}{2}$

22) $\cot \theta = \frac{4}{3}$ and $\pi < \theta < \frac{3\pi}{2}$
Find $\sin 2\theta$

23) $\cot \theta = \frac{4}{3}$ and $\pi < \theta < \frac{3\pi}{2}$
Find $\cot 2\theta$

24) $\tan \theta = 2$ and $0 < \theta < \frac{\pi}{2}$
Find $\sin \frac{\theta}{2}$

25) $\sin \theta = -\frac{3}{5}$ and $\frac{3\pi}{2} < \theta < 2\pi$
Find $\tan \frac{\theta}{2}$

26) $\cot \theta = -\frac{3\sqrt{91}}{91}$ and $\frac{3\pi}{2} < \theta < 2\pi$
Find $\sin \frac{\theta}{2}$

Double- and Half-Angle Identities

Use a double-angle identity to find the exact value of each expression.

1) $\sin 120^\circ$

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

2) $\tan 60^\circ$

$$\sqrt{3}$$

3) $\cos \frac{4\pi}{3}$

$$-\frac{1}{2}$$

4) $\sin \frac{5\pi}{3}$

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

Use a half-angle identity to find the exact value of each expression.

5) $\tan 45^\circ$

$$1$$

6) $\sin 165^\circ$

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

7) $\sin \frac{5\pi}{6}$

$$\frac{1}{2}$$

8) $\cos 30^\circ$

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

Use a double-angle or half-angle identity to find the exact value of each expression.

9) $\cot \frac{\pi}{3}$

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

10) $\cot \frac{2\pi}{3}$

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

11) $\sec \frac{5\pi}{12}$

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

12) $\cot 60^\circ$

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

13) $\cot 240^\circ$

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

14) $\cot \frac{5\pi}{3}$

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

$$15) \sin \theta = -\frac{7}{25} \text{ and } 270^\circ < \theta < 360^\circ$$

$$\text{Find } \cos \frac{\theta}{2}$$

$$-\frac{7\sqrt{2}}{10}$$

$$17) \cos \theta = \frac{4}{5} \text{ and } 270^\circ < \theta < 360^\circ$$

$$\text{Find } \sin 2\theta$$

$$-\frac{24}{25}$$

$$19) \cos \theta = -\frac{4}{5} \text{ and } 90^\circ < \theta < 180^\circ$$

$$\text{Find } \sin \frac{\theta}{2}$$

$$\frac{3\sqrt{10}}{10}$$

$$21) \tan \theta = -\frac{7}{24} \text{ and } \frac{3\pi}{2} < \theta < 2\pi$$

$$\text{Find } \cot \frac{\theta}{2}$$

$$-7$$

$$23) \cot \theta = \frac{4}{3} \text{ and } \pi < \theta < \frac{3\pi}{2}$$

$$\text{Find } \cot 2\theta$$

$$\frac{7}{24}$$

$$25) \sin \theta = -\frac{3}{5} \text{ and } \frac{3\pi}{2} < \theta < 2\pi$$

$$\text{Find } \tan \frac{\theta}{2}$$

$$-\frac{1}{3}$$

$$16) \cos \theta = \frac{1}{3} \text{ and } 0^\circ < \theta < 90^\circ$$

$$\text{Find } \sin 2\theta$$

$$\frac{4\sqrt{2}}{9}$$

$$18) \cos \theta = \frac{2\sqrt{5}}{5} \text{ and } 0^\circ < \theta < 90^\circ$$

$$\text{Find } \sin \frac{\theta}{2}$$

$$\frac{\sqrt{50 - 20\sqrt{5}}}{10}$$

$$20) \cos \theta = -\frac{15}{17} \text{ and } 180^\circ < \theta < 270^\circ$$

$$\text{Find } \tan \frac{\theta}{2}$$

$$-4$$

$$22) \cot \theta = \frac{4}{3} \text{ and } \pi < \theta < \frac{3\pi}{2}$$

$$\text{Find } \sin 2\theta$$

$$\frac{24}{25}$$

$$24) \tan \theta = 2 \text{ and } 0 < \theta < \frac{\pi}{2}$$

$$\text{Find } \sin \frac{\theta}{2}$$

$$\frac{\sqrt{50 - 10\sqrt{5}}}{10}$$

$$26) \cot \theta = -\frac{3\sqrt{91}}{91} \text{ and } \frac{3\pi}{2} < \theta < 2\pi$$

$$\text{Find } \sin \frac{\theta}{2}$$

$$\frac{\sqrt{35}}{10}$$