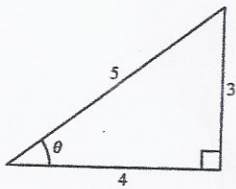


Figure for Exercises 1-7



$$\sin \theta = \frac{3}{5}$$

$$\cos \theta = \frac{4}{5}$$

$$\tan \theta = \frac{3}{4}$$

1. $\sin \theta = \frac{3}{5}$

3. $\cos 2\theta = 2 \cos^2 \theta - 1$

$$= 2\left(\frac{4}{5}\right)^2 - 1$$

$$= \frac{32}{25} - \frac{25}{25}$$

$$= \frac{7}{25}$$

5. $\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$

$$= \frac{2(3/4)}{1 - (3/4)^2}$$

$$= \frac{3/2}{1 - (9/16)}$$

$$= \frac{3}{2} \cdot \frac{16}{7}$$

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

7. $\csc 2\theta = \frac{1}{\sin 2\theta}$

$$= \frac{1}{2 \sin \theta \cos \theta}$$

$$= \frac{1}{2(3/5)(4/5)}$$

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

22. $\cos u = -\frac{2}{7}$, $\frac{\pi}{2} < u < \pi$ Quadrant II

$$\sin 2u = 2 \sin u \cos u = 2\left(\frac{\sqrt{45}}{7}\right)\left(-\frac{2}{7}\right) = -\frac{12\sqrt{5}}{49}$$

$$\cos 2u = \cos^2 u - \sin^2 u = \frac{4}{49} - \frac{45}{49} = -\frac{41}{49}$$

$$\tan 2u = \frac{2 \tan u}{1 - \tan^2 u} = \frac{2\left(-\frac{\sqrt{45}}{2}\right)}{1 - \frac{45}{4}} = \frac{-\sqrt{45}}{\frac{4-45}{4}} = \frac{12\sqrt{5}}{41}$$

23. $\tan u = \frac{1}{2}$, $\pi < u < \frac{3\pi}{2} \Rightarrow \sin u = -\frac{1}{\sqrt{5}}$ and

$$\cos u = -\frac{2}{\sqrt{5}}$$

$$\sin 2u = 2 \sin u \cos u = 2\left(-\frac{1}{\sqrt{5}}\right)\left(-\frac{2}{\sqrt{5}}\right) = \frac{4}{5}$$

$$\cos 2u = \cos^2 u - \sin^2 u = \left(-\frac{2}{\sqrt{5}}\right)^2 - \left(-\frac{1}{\sqrt{5}}\right)^2 = \frac{3}{5}$$

$$\tan 2u = \frac{2 \tan u}{1 - \tan^2 u} = \frac{2(1/2)}{1 - (1/4)} = \frac{4}{3}$$

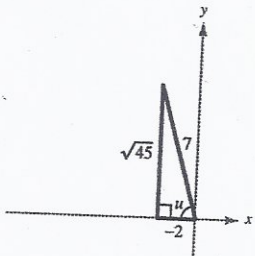
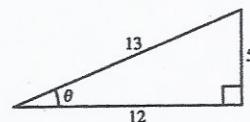


Figure for Exercises 31 - 35



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

$$\cos \theta = \frac{12}{13}$$

31. $\cos \frac{\theta}{2} = \sqrt{\frac{1 + \cos \theta}{2}} = \sqrt{\frac{1 + (12/13)}{2}} = \sqrt{\frac{25}{26}} = \frac{5}{\sqrt{26}} = \frac{5\sqrt{26}}{26}$

33. $\tan \frac{\theta}{2} = \frac{\sin \theta}{1 + \cos \theta} = \frac{5/13}{1 + (12/13)} = \frac{5}{25} = \frac{1}{5}$

$$43. \sin \frac{\pi}{8} = \sin \left[\frac{1}{2} \left(\frac{\pi}{4} \right) \right] = \sqrt{\frac{1 - \cos(\pi/4)}{2}} = \frac{1}{2} \sqrt{2 - \sqrt{2}}$$

$$\cos \frac{\pi}{8} = \cos \left[\frac{1}{2} \left(\frac{\pi}{4} \right) \right] = \sqrt{\frac{1 + \cos(\pi/4)}{2}} = \frac{1}{2} \sqrt{2 + \sqrt{2}}$$

$$\tan \frac{\pi}{8} = \tan \left[\frac{1}{2} \left(\frac{\pi}{4} \right) \right] = \frac{\sin(\pi/4)}{1 + \cos(\pi/4)} = \frac{\sqrt{2}/2}{1 + (\sqrt{2}/2)} = \sqrt{2} - 1$$

$$47. \sin u = \frac{5}{13}, \frac{\pi}{2} < u < \pi \Rightarrow \cos u = -\frac{12}{13}$$

$$\sin \left(\frac{u}{2} \right) = \sqrt{\frac{1 - \cos u}{2}} = \sqrt{\frac{1 + (12/13)}{2}} = \frac{5\sqrt{26}}{26}$$

$$\cos \left(\frac{u}{2} \right) = \sqrt{\frac{1 + \cos u}{2}} = \sqrt{\frac{1 - (12/13)}{2}} = \frac{\sqrt{26}}{26}$$

$$\tan \left(\frac{u}{2} \right) = \frac{\sin u}{1 + \cos u} = \frac{5/13}{1 - (12/13)} = \frac{5}{1} = 5$$

$$\begin{aligned} 81. \csc 2\theta &= \frac{1}{\sin 2\theta} \\ &= \frac{1}{2 \sin \theta \cos \theta} \\ &= \frac{1}{\sin \theta} \cdot \frac{1}{2 \cos \theta} \\ &= \frac{\csc \theta}{2 \cos \theta} \end{aligned}$$

$$\begin{aligned} 84. \cos^4 x - \sin^4 x &= (\cos^2 x - \sin^2 x)(\cos^2 x + \sin^2 x) \\ &= (\cos 2x)(1) \\ &= \cos 2x \end{aligned}$$

$$\begin{aligned} 85. (\sin x + \cos x)^2 &= \sin^2 x + 2 \sin x \cos x + \cos^2 x \\ &= (\sin^2 x + \cos^2 x) + 2 \sin x \cos x \\ &= 1 + \sin 2x \end{aligned}$$