# 5.3A HW Answers

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**39.** Because $15°$ lies in quadrant I, $\sin 15° > 0$.

$$\sin 15° = \sin \frac{30°}{2}$$
$$= \sqrt{\frac{1-\cos 30°}{2}} = \sqrt{\frac{1-\frac{\sqrt{3}}{2}}{2}}$$
$$= \sqrt{\frac{2-\sqrt{3}}{4}} = \frac{\sqrt{2-\sqrt{3}}}{2}$$

**40.** Because $22.5°$ lies in quadrant I, $\cos 22.5° > 0$.

$$\cos 22.5^{\circ} = \cos \frac{45^{\circ}}{2} = \sqrt{\frac{1+\cos 45^{\circ}}{2}}$$
$$= \sqrt{\frac{1+\frac{\sqrt{2}}{2}}{2}}$$
$$= \sqrt{\frac{2+\sqrt{2}}{4}}$$
$$= \frac{\sqrt{2+\sqrt{2}}}{2}$$

**41.** Because $157.5°$ lies in quadrant II, $\cos 157.5° < 0$.

$$\cos 157.5° = \cos \frac{315°}{2} = -\sqrt{\frac{1+\cos 315°}{2}}$$
$$= -\sqrt{\frac{1+\frac{\sqrt{2}}{2}}{2}} = -\sqrt{\frac{2+\sqrt{2}}{4}}$$
$$= -\frac{\sqrt{2+\sqrt{2}}}{2}$$

**42.** Because $105°$ lies in quadrant II, $\sin 105° > 0$.

$$\sin 105^{\circ} = \sin \frac{210^{\circ}}{2} = \sqrt{\frac{1-\cos 210^{\circ}}{2}}$$
$$= \sqrt{\frac{1-\left(-\frac{\sqrt{3}}{2}\right)}{2}}$$
$$= \sqrt{\frac{2+\sqrt{3}}{4}}$$
$$= \frac{\sqrt{2+\sqrt{3}}}{2}$$

**43.** Because $75°$ lies in quadrant I, $\tan 75° > 0$.

$$\tan 75° = \tan \frac{150°}{2} = \frac{1-\cos 150°}{\sin 150°}$$
$$= \frac{1-\left(-\frac{\sqrt{3}}{2}\right)}{\frac{1}{2}} = 2+\sqrt{3}$$

**44.** Because $112.5°$ lies in quadrant II, $\tan 112.5^{0} < 0$.

$$\tan \cancel{125}^{\circ} = \tan \frac{225^{\circ}}{2}$$

112.5°

$$= \frac{1-\cos 225^{\circ}}{\sin 225^{\circ}}$$
$$= \frac{1-\left(-\frac{\sqrt{2}}{2}\right)}{-\frac{\sqrt{2}}{2}}$$

**45.** Because $\frac{7\pi}{8}$ lies in quadrant II, $\tan \frac{7\pi}{8} < 0$.

$$\tan \frac{7\pi}{8} = \tan\left(\frac{\frac{7\pi}{4}}{2}\right) = \frac{1-\cos \frac{7\pi}{4}}{\sin \frac{7\pi}{4}}$$
$$= \frac{1-\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}} = -\frac{2}{\sqrt{2}}+1$$
$$= -\sqrt{2}+1$$

**46.** Because $\frac{3\pi}{8}$ lies in quadrant I, $\tan \frac{3\pi}{8} > 0$.

$$\tan \frac{3\pi}{8} = \tan \frac{\frac{3\pi}{4}}{2}$$
$$= \frac{1-\cos \frac{3\pi}{4}}{\sin \frac{3\pi}{4}}$$

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

$$= \frac{2+\sqrt{2}}{-\sqrt{2}}$$

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

$$= -\sqrt{2} - 1$$

$$= \frac{1-\cos\frac{3\pi}{4}}{\sin\frac{3\pi}{4}}$$

$$= \frac{1-\left(-\frac{\sqrt{2}}{2}\right)}{\frac{\sqrt{2}}{2}}$$

$$= \frac{2}{\sqrt{2}} + 1$$

$$= \sqrt{2} + 1$$