8-3 Additional Practice

Trigonometric Identities

1. How are $\cos(x + \pi)$ and $\cos(2\pi - x)$ related to $\cos x$?

2. What is a simplified form of the expression $\cot\left(x - \frac{\pi}{2}\right)$?

3. What is a simplified form of the expression $\cos(-x) \cot(-x) \sin x$?

4. What is the exact value of $\tan 75°$?

5. What is the approximate value of $\sin\left(-\frac{\pi}{36}\right)$?

6. During calculations, a student made an error. What error did she make? What is the correct answer?

$$\begin{aligned}\sin 105° &= \sin(60° + 45°)\\ &= \sin 60° \cos 45° - \sin 45° \cos 60°\\ &= \left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}}{2}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)\\ &= \frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4}\\ &= \frac{\sqrt{6} - \sqrt{2}}{4}\end{aligned}$$

7. The length of a guy-wire supporting a vertical communication antenna is d feet. The length of its shadow depends on the measure of the angle θ it makes with the horizon. The shadow of the guy-wire is defined by $L = \frac{d \sin(\theta - 90°)}{-\sin \theta}$. Show that this equation is equivalent to $L = d \cot \theta$.

8-3 Additional Practice

Trigonometric Identities

1. How are $\cos(x + \pi)$ and $\cos(2\pi - x)$ related to $\cos x$?

   $\cos(x + \pi) = -\cos x$ and $\cos(2\pi - x) = \cos x$

2. What is a simplified form of the expression $\cot\left(x - \frac{\pi}{2}\right)$?

   $-\tan x$

3. What is a simplified form of the expression $\cos(-x) \cot(-x) \sin x$?

   $-\cos^2 x$

4. What is the exact value of $\tan 75°$?

   $\sqrt{3} + 2$

5. What is the approximate value of $\sin\left(-\frac{\pi}{36}\right)$?

   -0.09

6. During calculations, a student made an error. What error did she make? What is the correct answer?

$$\begin{aligned}\sin 105° &= \sin(60° + 45°)\\ &= \sin 60° \cos 45° - \sin 45° \cos 60°\\ &= \left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}}{2}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)\\ &= \frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4}\\ &= \frac{\sqrt{6} - \sqrt{2}}{4}\end{aligned}$$

Sample Answer: The student remembered the formula for the sine of a sum of angles incorrectly. There should be a plus sign instead of a minus sign between the two terms on the right. The correct answer is $\frac{\sqrt{6} + \sqrt{2}}{4}$.

7. The length of a guy-wire supporting a vertical communication antenna is d feet. The length of its shadow depends on the measure of the angle θ it makes with the horizon. The shadow of the guy-wire is defined by $L = \frac{d \sin(\theta - 90°)}{-\sin \theta}$. Show that this equation is equivalent to $L = d \cot \theta$.

$$L = \frac{d \sin(\theta - 90°)}{-\sin \theta} = \frac{d \sin[-(90° - \theta)]}{-\sin \theta}$$

$$= \frac{-d \sin(90° - \theta)}{-\sin \theta}$$

$$= \frac{d \cos(\theta)}{\sin \theta} = d \cot \theta$$