NAME _____ DATE _____ PERIOD _____

5-4 Word Problem Practice

Sum and Difference Identities

1. ENGINEERING Two highways branch off each other at an angle of 75°. An engineer uses tan 75° to determine the height of an exit ramp at a particular point. Find the exact value of tan 75°.

$2 + \sqrt{3}$

2. SHIPS The wheel of a ship is connected to a mechanical or hydraulic system so that turning the wheel adjusts the angle of the rudder, which changes the direction of the ship. The wheel in the diagram shows a counterclockwise rotation of the wheel from A to B. The coordinates of B are $(10 \cos (\theta + 60°), 10 \sin (\theta + 60°))$.
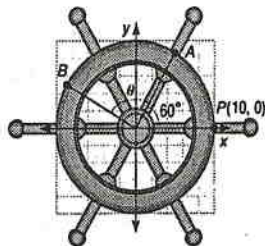
a. Rewrite the x-coordinate in terms of one or more functions of θ.

$5 \cos \theta - 5\sqrt{3} \sin \theta$

b. Rewrite the y-coordinate in terms of one or more functions of θ.

$5 \sin \theta + 5\sqrt{3} \cos \theta$

**3. ELECTRICITY** The current I in amperes in an alternating current at time t in seconds can be found with the formula $I = 30 \sin \left(50\pi t - \frac{7\pi}{3}\right)$. Rewrite the formula in terms of one or more functions of $50\pi t$.

$I = 15 \sin (50\pi t) - 15\sqrt{3} \cos (50\pi t)$

4. AIRPLANE ROUTES The lines L_1 and L_2 represent the flight paths of two airplanes. The tangent of the angle θ where the flight paths cross can be described by the expression $\dfrac{\tan 80° - \tan 50°}{1 + \tan 80° \tan 50°}$.
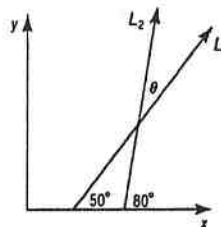
a. Rewrite the expression as the sum or difference of two angle measures.

$\tan (80° - 50°)$

b. Find the exact value of the expression in part **a.**

$\tan 30° = \dfrac{\sqrt{3}}{3}$

5. SKATEBOARD RAMP The cosine of the angle of elevation of a skateboard ramp can be described by the expression $\cos 55° \cos 35° + \sin 55° \sin 35°$. Simplify this expression. $\cos 20°$

6. TEMPERATURE A city's average daily high temperature can be modeled by $y = 14.33 \sin (0.56x - 2.44) + 60.79$, where $x = 1$ corresponds to January. Rewrite the formula using the Sine Difference Identity.

$y = 14.33 (\sin 0.56x \cos 2.44 - \cos 0.56x \sin 2.44) + 60.79$

Answers