SOLVING TRIGONOMETRIC EQUATIONS **Solve the equation for $0 \le x < 2\pi$.**

33. $\cos\left(x + \frac{\pi}{6}\right) - 1 = \cos\left(x - \frac{\pi}{6}\right)$

34. $\sin\left(x + \frac{\pi}{4}\right) + \sin\left(x - \frac{\pi}{4}\right) = 0$

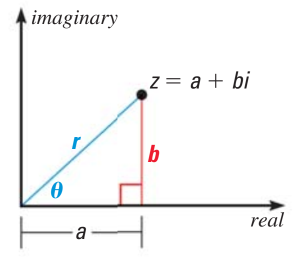
35. $\sin\left(x + \frac{5\pi}{6}\right) + \sin\left(x - \frac{5\pi}{6}\right) = 1$

36. $\tan(x + \pi) + \cos\left(x + \frac{\pi}{2}\right) = 0$

37. $\tan(x + \pi) + 2\sin(x + \pi) = 0$

38. $\sin(x + \pi) + \cos(x + \pi) = 0$

39. CHALLENGE Consider a complex number $z = a + bi$ in the complex plane shown. Let r be the length of the line segment joining z and the origin, and let θ be the angle that this segment makes with the positive real axis, as shown.



a. *Explain* why $a = r\cos\theta$ and $b = r\sin\theta$, so that $z = (r\cos\theta) + i(r\sin\theta)$.

b. Use the result from part (a) to show the following:

$z^2 = r^2[(\cos\theta\cos\theta - \sin\theta\sin\theta) + i(\sin\theta\cos\theta + \cos\theta\sin\theta)]$

c. Use the sum and difference formulas to show that the equation in part (b) can be written as $z^2 = r^2(\cos 2\theta + i\sin 2\theta)$.

PROBLEM SOLVING

EXAMPLE 5 on p. 951 for Exs. 40–41

40. METEOROLOGY The number h of hours of daylight for Rome, Italy, and Miami, Florida, can be approximated by the equations below, where t is the time in days and $t = 0$ represents January 1.

Rome: $h_1 = 2.7\sin\left(\frac{\pi t}{182} - 4.94\right) + 12.1$ **Miami:** $h_2 = -1.6\cos\frac{\pi t}{182} + 12.1$

On which days of the year will the cities have the same amount of daylight?

TEXAS @HomeTutor for problem solving help at classzone.com

41. CLOCK TOWER The heights m and h (in feet) of a clock tower's minute hand and hour hand, respectively, can be approximated by

$m = 182.5 - 11.5\sin\left(\frac{\pi t}{30} - \frac{\pi}{2}\right)$ and $h = 182.5 - 7\sin\left(\frac{\pi t}{360}\right)$

where t is the time in minutes and $t = 0$ represents 3:00 P.M. Use a graphing calculator to find how long it takes for the height of the minute hand to equal the height of the hour hand.

TEXAS @HomeTutor for problem solving help at classzone.com

42. PHYSICAL SCIENCE When a wave travels through a taut string, the displacement y of each point on the string depends on the time t and the point's position x. The equation of a *standing wave* can be obtained by adding the displacements of two waves traveling in opposite directions. Suppose two waves can be modeled by these equations:

$y_1 = A\cos\left(\frac{2\pi t}{3} - \frac{2\pi x}{5}\right)$ $y_2 = A\cos\left(\frac{2\pi t}{3} + \frac{2\pi x}{5}\right)$

Show that $y_1 + y_2 = 2A\cos\left(\frac{2\pi t}{3}\right)\cos\left(\frac{2\pi x}{5}\right)$.