

6.4 Investigating Identical Expressions

In previous courses, you solved linear equations and quadratic equations. Now you can also solve linear trigonometric equations. Even though these three types of equations are solved using different strategies, some of these equations can be similar.

Defining an Identity

Think, Do, Discuss

1. With or without graphing technology, graph $y = 3(x + 2)$. On the same set of axes, graph $y = 3x + 6$.
2. How many points of intersection exist between the two relationships?
3. Solve $3(x + 2) = 3x + 6$.
4. What happens when you try to solve this equation?
5. How many solutions are possible for this equation?
6. Are there any real numbers that do not satisfy the equation? Explain.
7. Compare the left side and right side of the original equation. How would you describe the relation between these expressions?
8. Repeat steps 1 to 7 for $(x - 1)(x + 1) = x^2 - 1$.
9. Equations like the ones in steps 3 and 8 are called **identities**. Explain why this name is appropriate.
10. Are $4x + 6x = 10x$, $(x + 3)(x + 2) = x^2 + 5x + 6$, and $\sin x = \cos\left(x - \frac{\pi}{2}\right)$ identities? Explain.
11. Explain how to show graphically that a given equation is an identity.

Did You Know?

Would you like to make one million dollars? It's easy—all you have to do is prove, or disprove, Goldbach's Conjecture. In 1742, Christian Goldbach conjectured that every even number greater than 2 can be expressed as the sum of two prime numbers. Since then, mathematicians have been working hard to find out whether this conjecture is true or not. In 2000, Faber and Faber published a novel called *Uncle Petros and Goldbach's Conjecture*. To publicize the book, they offered a prize of \$1 million (U.S.) to anyone who could resolve the conjecture. There is also a practical reason for wanting to know whether the conjecture is true. If it is, then computer scientists can use it to design new methods to protect coded messages.