COMPLEX CONJUGATES Two complex numbers of the form $a + bi$ and $a - bi$ are called **complex conjugates**. The product of complex conjugates is always a real number. For example, $(2 + 4i)(2 - 4i) = 4 - 8i + 8i + 16 = 20$. You can use this fact to write the quotient of two complex numbers in standard form.

EXAMPLE 5 Divide complex numbers

Write the quotient $\frac{7 + 5i}{1 - 4i}$ in standard form.

REWRITE QUOTIENTS
When a quotient has an imaginary number in the denominator, rewrite the denominator as a real number so you can express the quotient in standard form.

$$\frac{7 + 5i}{1 - 4i} = \frac{7 + 5i}{1 - 4i} \cdot \frac{1 + 4i}{1 + 4i}$$ **Multiply numerator and denominator by $1 + 4i$, the complex conjugate of $1 - 4i$.**

$$= \frac{7 + 28i + 5i + 20i^2}{1 + 4i - 4i - 16i^2}$$ **Multiply using FOIL.**

$$= \frac{7 + 33i + 20(-1)}{1 - 16(-1)}$$ **Simplify and use $i^2 = 1$.**

$$= \frac{-13 + 33i}{17}$$ **Simplify.**

$$= -\frac{13}{17} + \frac{33}{17}i$$ **Write in standard form.**

GUIDED PRACTICE for Examples 3, 4, and 5

10. WHAT IF? In Example 3, what is the impedance of the circuit if the given capacitor is replaced with one having a reactance of 7 ohms?

Write the expression as a complex number in standard form.

11. $i(9 - i)$ **12.** $(3 + i)(5 - i)$ **13.** $\frac{5}{1 + i}$ **14.** $\frac{5 + 2i}{3 - 2i}$

COMPLEX PLANE Just as every real number corresponds to a point on the real number line, every complex number corresponds to a point in the **complex plane**. As shown in the next example, the complex plane has a horizontal axis called the *real axis* and a vertical axis called the *imaginary axis*.

EXAMPLE 6 Plot complex numbers

Plot the complex numbers in the same complex plane.

a. $3 - 2i$ **b.** $-2 + 4i$ **c.** $3i$ **d.** $-4 - 3i$

Solution

a. To plot $3 - 2i$, start at the origin, move 3 units to the right, and then move 2 units down.

b. To plot $-2 + 4i$, start at the origin, move 2 units to the left, and then move 4 units up.

c. To plot $3i$, start at the origin and move 3 units up.

d. To plot $-4 - 3i$, start at the origin, move 4 units to the left, and then move 3 units down.