Exercise 12

Let $f(x) = x - 3$, $g(x) = \sqrt{x}$, $h(x) = x^3$, and $j(x) = 2x$. Express each of the functions in Exercises 11 and 12 as a composition involving one or more of f, g, h, and j.

a. $y = 2x - 3$ **b.** $y = x^{3/2}$

c. $y = x^9$ **d.** $y = x - 6$

e. $y = 2\sqrt{x-3}$ **f.** $y = \sqrt{x^3 - 3}$

Solution

Express each of the functions as compositions.

a. $y = 2x - 3 = j(x) - 3 = f(j(x)) = f \circ j$

b. $y = x^{3/2} = \sqrt{x^3} = g(x^3) = g(h(x)) = g \circ h$

c. $y = x^9 = (x^3)^3 = h(x^3) = h(h(x)) = h \circ h$

d. $y = x - 6 = (x - 3) - 3 = f(x - 3) = f(f(x)) = f \circ f$

e. $y = 2\sqrt{x-3} = j\left(\sqrt{x-3}\right) = j(g(x-3)) = j(g(f(x))) = j \circ g \circ f$

f. $y = \sqrt{x^3 - 3} = g(x^3 - 3) = g(f(x^3)) = g(f(h(x))) = g \circ f \circ h$