Exercise 11

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. $y = \sqrt{x} - 3$ **b.** $y = 2\sqrt{x}$

c. $y = x^{1/4}$ **d.** $y = 4x$

e. $y = \sqrt{(x-3)^3}$ **f.** $y = (2x-6)^3$

Solution

Express each of the functions as compositions.

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

b. $y = 2\sqrt{x} = 2g(x) = j(g(x)) = j \circ g$

c. $y = x^{1/4} = \sqrt{\sqrt{x}} = \sqrt{g(x)} = g(g(x)) = g \circ g$

d. $y = 4x = 2(2x) = j(2x) = j(j(x)) = j \circ j$

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

f. $y = (2x-6)^3 = [2(x-3)]^3 = h(2(x-3)) = h(j(x-3)) = h(j(f(x))) = h \circ j \circ f$