

**Exercise 9**

In Exercises 7–10, write a formula for  $f \circ g \circ h$ .

$$f(x) = \sqrt{x+1}, \quad g(x) = \frac{1}{x+4}, \quad h(x) = \frac{1}{x}$$

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**Solution**

Evaluate the function composition.

$$\begin{aligned} f \circ g \circ h &= f(g(h(x))) \\ &= f\left(g\left(\frac{1}{x}\right)\right) \\ &= f\left(\frac{1}{\frac{1}{x}+4}\right) \\ &= \sqrt{\frac{1}{\frac{1}{x}+4}+1} \\ &= \sqrt{\frac{1}{\frac{1}{x}+\frac{4x}{x}}+1} \\ &= \sqrt{\frac{1}{\frac{1+4x}{x}}+1} \\ &= \sqrt{\frac{x}{1+4x}+1} \\ &= \sqrt{\frac{x}{1+4x}+\frac{1+4x}{1+4x}} \\ &= \sqrt{\frac{x+(1+4x)}{1+4x}} \\ &= \sqrt{\frac{5x+1}{1+4x}} \end{aligned}$$