

Example Given the two functions whose rules are:

$$f(x) = \frac{-2x+1}{x-3}$$

$$g(x) = \frac{-x+2}{3x-1}$$

Compute the rule for the composite $f \circ g(x)$

Solution To compute $f \circ g(x)$, evaluate $f(x)$ at $g(x)$

Replace x in $f(x)$ by $g(x)$

$$f(g(x)) = \frac{-2x+1}{x-3} \Bigg|_{\substack{-x+2 \\ 3x-1}} = \frac{-2\left(\frac{-x+2}{3x-1}\right) + \frac{3x-1}{3x-1}}{\left(\frac{-x+2}{3x-1}\right) - \frac{3(3x-1)}{3x-1}}$$

$$= \frac{\frac{2x-4+3x-1}{3x-1}}{\frac{-x+2-9x+3}{3x-1}} = \frac{5x-5}{-10x+5} = \frac{x-1}{-2x+1}$$

Answer $f \circ g(x) = \frac{x-1}{-2x+1}$

Exercise For each pair of functions, compute the required composite.

Answers

1. $f(x) = \frac{-3x+2}{x-4}$

$g \circ f(x) =$

$g(x) = \frac{2x+1}{3x+2}$

$$\frac{-5x}{-7x-2}$$

2. $f(x) = -3x+1$

$f \circ g(x) =$

$g(x) = \frac{-x+4}{2x-3}$

$$\frac{5x-15}{2x-3}$$

3. $f(x) = \frac{4x-3}{x-2}$

$g \circ f(x) =$

$g(x) = \frac{3x-1}{x}$

$$\frac{11x-7}{4x-3}$$