

1. $f(x) = 2x$, $g(x) = \frac{1}{2}x$

2. $f(x) = ax + b$, $g(x) = \frac{1}{a}(x - b)$, $a \neq 0$

3. $f(x) = \frac{1}{x}$, $g(x) = \frac{1}{x}$

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

(a) $(f \circ g)(x)$

(b) $(g \circ f)(x)$

(c) $(f \circ f)(x)$

(d) $(g \circ g)(x)$

1. $f(x) = 2x + 3$, $g(x) = 3x$

2. $f(x) = \sqrt{x}$, $g(x) = x^2$

3. $f(x) = \frac{x + 1}{x - 1}$, $g(x) = \frac{x - 1}{x + 1}$

4. $f(x) = x + \frac{1}{x}$, $g(x) = x^2$

Composite Functions - Practice (and solutions)

For the given functions f and g , find (answer on the back)

For each of the following problems, show that $(f \circ g)(x) = (g \circ f)(x) = x$.

Answers

$$1 \text{ a) } f(g(x)) = 2(3x) + 3 = 6x + 3 \quad 2 \text{ a) } f(g(x)) = \sqrt{(x^2)} = x$$

$$\text{b) } g(f(x)) = 3(2x + 3) = 6x + 9 \quad \text{b) } g(f(x)) = (\sqrt{x})^2 = x$$

$$\text{c) } f(f(x)) = 2(2x + 3) + 3 = 4x + 9 \quad \text{c) } f(f(x)) = \sqrt{\sqrt{x}} = \sqrt[4]{x}$$

$$\text{d) } g(g(x)) = 3(3x) = 9x \quad \text{d) } g(g(x)) = (x^2)^2 = x^4$$

$$3 \text{ a) } f(g(x)) = \frac{\left(\frac{x-1}{x+1}\right)+1}{\left(\frac{x-1}{x+1}\right)-1} = -x$$

$$\text{b) } g(f(x)) = \frac{\left(\frac{x+1}{x-1}\right)-1}{\left(\frac{x+1}{x-1}\right)+1} = \frac{1}{x}$$

$$\text{c) } f(f(x)) = \frac{\left(\frac{x+1}{x-1}\right)+1}{\left(\frac{x+1}{x-1}\right)-1} = x$$

$$\text{d) } g(g(x)) = \frac{\left(\frac{x-1}{x+1}\right)-1}{\left(\frac{x-1}{x+1}\right)+1} = -\frac{1}{x}$$

$$4 \text{ a) } f(g(x)) = (x^2) + \frac{1}{(x^2)} = \frac{x^4+1}{x^2}$$

$$\text{b) } g(f(x)) = \left(x + \frac{1}{x}\right)^2 = \frac{x^4+2x^2+1}{x^2}$$

$$\text{c) } f(f(x)) = \left(x + \frac{1}{x}\right) + \frac{1}{\left(x + \frac{1}{x}\right)} = \frac{x^4+3x^2+1}{x^3+x}$$

$$\text{d) } g(g(x)) = (x^2)^2 = x^4$$