Composition of Functions

$+, -, \times, \div$

$f \circ g$

$f(x) = x - 4$ $\quad$ $g(x) = \dfrac{5x}{x+3}$ $\quad$ $x \neq -3$

$\mathbb{R}$

$(f+g)(x) = \dfrac{(x+3)\,x-4}{(x+3)\,1} + \dfrac{5x}{x+3}$

$= \dfrac{x^2 - x - 12 + 5x}{x+3} = \dfrac{x^2 + 4x - 12}{x+3}$ $\boxed{x \neq -3}$

$\left(\dfrac{f}{g}\right)(x) = \dfrac{x-4}{\frac{5x}{x+3}} = \dfrac{x-4}{1} \cdot \dfrac{x+3}{5x} = \dfrac{x^2 - x - 12}{5x}$

$\boxed{x \neq -3, 0}$

* must check domains of original functions as well as domain of new function!

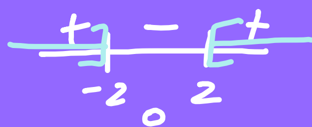
$f(x) = x - 4$ $\quad g(x) = \dfrac{5x}{x+3}$

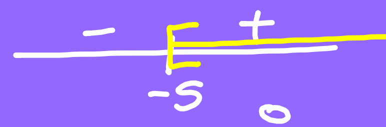
$\mathbb{R}$ $\quad x \neq -3$

$(g \circ f)(x) = \dfrac{5(x-4)}{x-4+3} = \dfrac{5x-20}{x-1} \quad x \neq 1, -3$

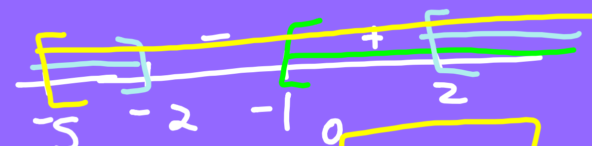
$g[f(x)]$

$p(x) = \sqrt{x^2 - 4}$ $\qquad$ $q(x) = \sqrt{x+5}$





$(p \circ q)(x) = \sqrt{\left(\sqrt{x+5}\right)^2 - 4} = \sqrt{x+5-4} = \sqrt{x+1}$



$\boxed{[2, \infty)}$

$(f \circ g)(x) = (x^2 + 2x - 4)^5$

Find the original functions f & g.

$f(x) = x^5$

$g(x) = x^2 + 2x - 4$

$f(x) = (x - 4)^5$

$g(x) = x^2 + 2x$