

COMPOSITION OF FUNCTIONS

Combining functions = $+$, $-$, \times , \div , $f \circ g$

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

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

$$= \frac{x^2 - x - 12 + 5x}{x+3}$$

1) Domain of f

2) Domain of g

3) Domain of combined function

4) Find where all 3 domains exist.

$$= \frac{x^2 + 4x - 12}{x+3} = \frac{(x+6)(x-2)}{x+3}$$

$$x \neq -3$$

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

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

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

$x \neq 0$

Domain: $x \neq -3, 0$

$$p(x) = \sqrt{x^2 - 4}$$

$(-\infty, -2] \cup [2, \infty)$

$$q(x) = \sqrt{x+5}$$

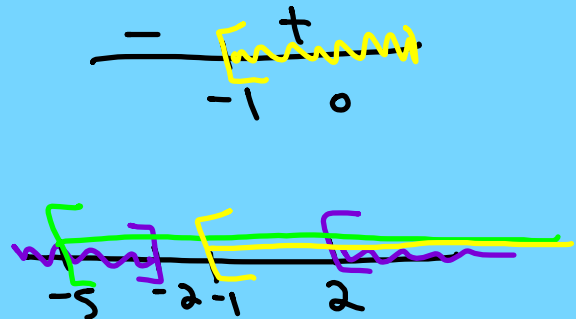
$[-5, \infty)$

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

$$= \sqrt{x+5-4}$$

$$= \sqrt{x+1}$$

$[2, \infty)$



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

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

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

$$\left\{ \begin{array}{l} g(x) = (x - 4)^5 \\ f(x) = x^2 + 2x \end{array} \right.$$

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