- Let $f(x) = \dfrac{2}{x+3}$ and $g(x) = \dfrac{1}{x-2}$. Find and completely simplify $f \circ g$. What is the domain of the composition?

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

Simplify...

$$\frac{2}{\frac{1}{x-2}+3} \cdot \frac{(x-2)}{(x-2)} = \frac{2(x-2)}{1+3(x-2)} = \frac{2x-4}{3x-5}$$

So, $f(g(x)) = \dfrac{2x-4}{3x-5}$

The domain of this new function is $\{x : x \neq \frac{5}{3}\}$

★ Technical detail:

We should also exclude $x = 2$ from the domain.

Because $g(2)$ is not defined. We cannot plug $g(2)$ into $f(x)$!

Domain of $f \circ g$ is $\{x : x \neq \frac{5}{3} \text{ and } x \neq 2\}$