Quiz 9

1 Given

$$f(x) = x^2,$$

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

a Find a simplified formula for $f \circ g$. (Show at least one intermediate step.)

I plug the formula for g into the formula for f:

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

This is simplified as a factored expression, but you could also expand it: $(f \circ g)(x) = (x^2 + 4)^2 = x^4 + 8x^2 + 16$.

b Find a simplified formula for $g \circ f$. (Show at least one intermediate step.) Now I plug the formula for f into the formula for g:

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

2 Given

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

find the the domain of $f \circ g$. (Show at least how you calculate every constant number that appears in your answer.)

First, dom $g = \{x \mid x \neq 0\}$, since we're dividing by x in g(x). Next, since we're dividing by x - 1 in f(x), we're dividing by g(x) - 1 in $(f \circ g)(x)$: $g(x) - 1 \neq 0$;

$$x) - 1 \neq 0;$$

$$\frac{2}{x} - 1 \neq 0;$$

$$2 - x \neq 0;$$

$$-x \neq -2;$$

$$x \neq 2.$$

Therefore,

$$\operatorname{dom}\left(f\circ g\right) = \{x \mid x \neq 0, \ x \neq 2\}.$$