1 Given

$$
\begin{gathered}
f(x)=\frac{3}{x-1} \\
g(x)=\frac{2}{x}
\end{gathered}
$$

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

First, $\operatorname{dom} g=\{x \mid x \neq 0\}$, 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 $(f \circ g)(x)$ :

$$
\begin{aligned}
g(x)-1 & \neq 0 \\
\frac{2}{x}-1 & \neq 0 \\
2-x & \neq 0 \\
-x & \neq-2 \\
x & \neq 2
\end{aligned}
$$

Therefore,

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

2 Given

$$
f(x)=4 x+2
$$

find a formula for the inverse of $f$. Show at least what equation you solve to find this, as well as your final answer.
I set $f(x)=y$ and solve for $x$ to find $f^{-1}(y)$ :

$$
\begin{aligned}
f(x) & =y ; \\
4 x+2 & =y ; \\
4 x & =y-2 \\
x & =\frac{1}{4} y-\frac{1}{2} ; \\
f^{-1}(y) & =\frac{1}{4} y-\frac{1}{2} .
\end{aligned}
$$

3 Suppose that $f$ is a one-to-one function, the domain of $f$ is $[5, \infty)$, and the range of $f$ is $[-2, \infty)$. State the domain and range of $f^{-1}$ (indicating which is which).
Simply swap them:

$$
\begin{aligned}
\operatorname{dom} f^{-1} & =[-2, \infty), \\
\operatorname{ran} f^{-1} & =[5, \infty) .
\end{aligned}
$$

