Example 1

Find the inverse (undo) rule for the functions below. Use function notation and give the inverse rule a name different from the original function.

a. $f(x) = \frac{x-6}{3}$

b. $g(x) = (x+4)^2 + 1$

The function in part (a) subtracts six from the input then divides by three. The undo rule, or inverse, reverses this process. Therefore, the inverse first multiplies by three then adds six. If we call this inverse $h(x)$, we can write $h(x) = 3x + 6$.

The function $g(x)$ adds four to the input, squares that value, then adds one. The inverse will first subtract one, take the square root then subtract four. Calling this rule $j(x)$ we can write $j(x) = \pm\sqrt{x-1} - 4$.

$$
\begin{aligned}
f(x) &= \frac{x-6}{3} \\
y &= \frac{x-6}{3} \\
x &= \frac{y-6}{3} \\
3x &= y - 6 \\
3x + 6 &= y
\end{aligned}
$$

$$
\begin{aligned}
g(x) &= (x+4)^2 + 1 \\
y &= (x+4)^2 + 1 \\
x &= (y+4)^2 + 1 \\
x - 1 &= (y+4)^2 \\
\pm\sqrt{x-1} &= y + 4 \\
-4 \pm \sqrt{x-1} &= y
\end{aligned}
$$

Consider the function $f(x) = \frac{2x-1}{7}$. Determine the inverse of $f(x)$ and label it $g(x)$.

$$y = \frac{2x-1}{7}$$

$$x = \frac{2y-1}{7}$$

$$7x = 2y - 1$$

$$7x + 1 = 2y$$

$$y = \frac{7x+1}{2}$$

$$g(x) = \frac{7x+1}{2}$$