Answer on Question #81052 - Math - Calculus

Confirm that f and g are inverses by showing that f(g(x))=x and g(f(x))=x.
$f(x) = x^2 - 3$ AND $g(x) = \sqrt{3+x}$

The answer:

First, let us consider $f(g(x))$. As $g(x) = \sqrt{3+x}$ then we should consider only $x > -3$

$$f(g(x)) = (\sqrt{3+x})^2 - 3 = 3 + x - 3 = x \tag{1}$$

for any value x, so $f(x)$ is inverse to $g(x)$.

Let us consider $g(f(x))$. First let us check whether $f(x)$ is a one-to-one function. By definition A function F is one-to-one if it never takes the same value twice. So we should consider two regions: $x \geq \sqrt{3}$ and $x < \sqrt{3}$ where $f(x)$ is a one-to-one function.

$$g(f(x)) = \sqrt{3 + (x^2 - 3)} = |x| \tag{2}$$

As we specified above the function f has two regions where it is a one-to-one function: $x \geq \sqrt{3}$ or $x < \sqrt{3}$. Therefore, requiring $g(f(x)) = x$ one has got a region where the functions f and g are inverse: "The functions f and g are inverse for $x \geq 3$".