Guide to:
Functions (harder)

maths Links

Explanation:

A composite function **fg(x)** means apply function **g first**, then substitute that output into **f**, i.e. fg(x) = f(g(x)). Always work from the inside out, and remember that fg(x) is rarely equal to gf(x).

To find the inverse function $\mathbf{f^{-1}(x)}$, write **y = f(x)**, swap x and y (or rearrange directly to make the input variable the subject), and write your final answer in terms of x. If the original input appears twice, use the factorising rearrangement method.

Example 1: f(x) = 2x − 3 and g(x) = x^2 + 1. Solve fg(x) = 15.

Solution:

Substitute g(x) into f(x):

fg(x) = 2(x^2 + 1) − 3 = $\mathbf{2x^2 - 1}$

Set equal to 15: $2x^2 - 1 = 15 \Rightarrow 2x^2 = 16$

$x^2 = 8 \Rightarrow x = \pm\sqrt{8} = \pm 2\sqrt{2}$

Answer: x = ±2√2

Example 2: Given $h(x) = \frac{4x}{x+5}$, find $h^{-1}(x)$.

Solution:

Let $y = \frac{4x}{x+5}$ and swap x and y: $x = \frac{4y}{y+5}$

Multiply by (y + 5): xy + 5x = 4y

Collect y terms: 5x = 4y − xy = y(4 − x)

Divide by (4 − x): $y = \frac{5x}{4-x}$

Answer: $\mathbf{h^{-1}(x) = \frac{5x}{4-x}}$

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