

Inverse Functions and Slope

W-up:

Find $f \circ g(x)$ and $g \circ f(x)$ using the functions below.

$$f(x) = x^3 + 1$$

$$g(x) = \sqrt[3]{x-1}$$

Functions are inverses *if and only if*

$$f \circ f^{-1}(x) = x \quad \text{and} \quad f^{-1} \circ f(x) = x$$

Inverse functions are the result of switching the x and y coordinates resulting in graphs which reflect over the line $y = x$ (the identity line)

To find an inverse function simply switch the x and y and solve the equation for y

EX) Find the inverse of $f(x) = 3x^3 - 1$

GRAPHS OF INVERSE FUNCTIONS HAVE RECIPROCAL SLOPES AT INVERTED (switched) POINTS

Given $f(x) = x^3$ and $g(x) = \sqrt[3]{x}$

Find $f'(2)$ and $g'(8)$

EX) It is given that $h \circ p(x) = x$ and $h(-4) = 3$ while $h'(-4) = 9$.

Find $p'(3)$

AP Questions

EX 1)

If $f(-3) = 2$ and $f'(-3) = \frac{3}{4}$, then $(f^{-1})'(2) =$

(A) $\frac{1}{2}$

(B) $\frac{4}{3}$

(C) $\frac{3}{2}$

(D) $-\frac{3}{4}$

EX 2)

Let f be the function defined by $f(x) = 2x + e^x$. If $g(x) = f^{-1}(x)$ for all x and the point $(0, 1)$ is on the graph of f , what is the value of $g'(1)$?

(A) $\frac{1}{2+e}$

(B) $\frac{1}{3}$

(C) $\frac{1}{2}$

(D) 3

(E) $2+e$