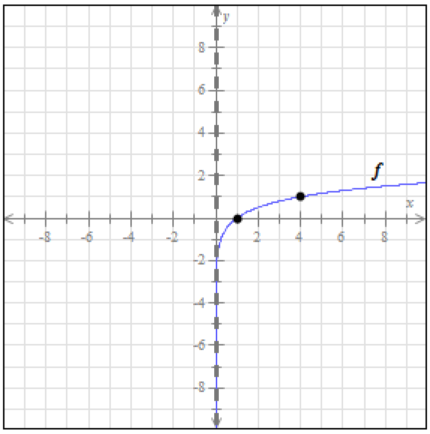
The graph, domain, and range of a logarithmic function

Graph the function $g(x) = \log_4(x-1)$ and give its domain and range using interval notation.

The graph of $g(x) = \log_4(x-1)$ is a transformation of the graph of $f(x) = \log_4 x$.

So let's first consider the graph of $f(x) = \log_4 x$.
It passes through the points $(1, 0)$ and $(4, 1)$.
It has a vertical asymptote $x = 0$.
The domain is $(0, \infty)$ and the range is $(-\infty, \infty)$.



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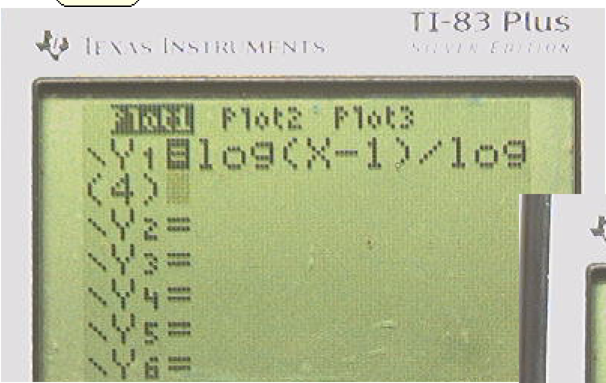
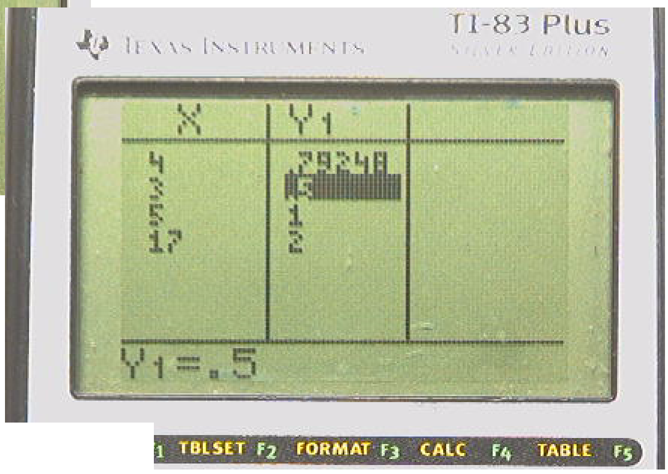
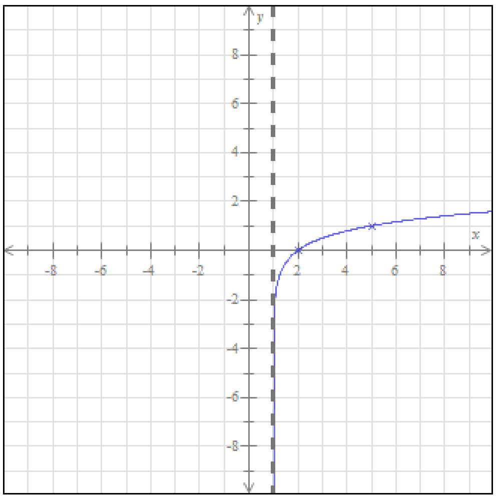




Here is the answer.



Domain: $(1, \infty)$
Range: $(-\infty, \infty)$

Determining whether two functions are inverses of each other

For each pair of functions f and g below, find $f(g(x))$ and $g(f(x))$. Then, determine whether f and g are inverses of each other.

Simplify your answers as much as possible.
(Assume that your expressions are defined for all x in the domain of the composition.
You do *not* have to indicate the domain.)

(a)	(b)
$f(x) = x + 4$	$f(x) = -\frac{6}{x}, x \neq 0$
$g(x) = x - 4$	$g(x) = \frac{6}{x}, x \neq 0$
$f(g(x)) =$ x	$f(g(x)) =$ -x
$g(f(x)) =$ x	$g(f(x)) =$ -x
● f and g are inverses of each other	○ f and g are inverses of each other
○ f and g are *not* inverses of each other	● f and g are *not* inverses of each other

$$f(g(x))=f(x-4)=(x-4)+4=x$$

$$g(f(x))=g(x+4)=(x+4)-4=x$$

$$f(g(x))=f(6/x)=-6/(6/x)$$

$$g(f(x))=g(-6/x)=6/(-6/x)$$

Composite Functions

$(f \circ g)(x) = f(g(x))$

$f(x) = x^2 + 2x - 7$

$f(a) = a^2 + 2a - 7$

$f(a+h) = (a+h)^2 + 2(a+h) - 7$

$f(a+h) = a^2 + 2ah + h^2 + 2a + 2h - 7$

$\quad\quad\quad\;\; -a^2 \quad\quad\quad\quad -2a \quad\quad -7$

$f(a+h) - f(a) = 2ah + h^2 + 2h$

$\frac{f(a+h) - f(a)}{h} = \frac{2ah + h^2 + 2h}{h}$

$= 2a + h + 2$

Rewrite as a logarithmic equation.

$9^2 = 81$

$\log_{base}($ across $)=$

$\log_9(81)$=exponent=2