

Answer on Question #44582 – Math - Calculus

If we consider the expression $1/2-3x$

as a function on R , what will be its domain and

range? Will it have an inverse? Justify your answer.

Solution.

$$f(x) = \frac{1}{2-3x},$$

The domain is all real numbers except those when denominator = 0, *i. e.* $2 - 3x = 0 \rightarrow$

$$x = \frac{2}{3}$$

Domain: all $x \in R$, except $x = \frac{2}{3}$ or $\{-\infty < x < \frac{2}{3}\} \cup \{\frac{2}{3} < x < \infty\}$,

The range is all real numbers except 0 because a fraction is 0 only when its numerator is 0, and in this case its numerator is never 0.

Range: $\{-\infty < f(x) < 0\} \cup \{0 < f(x) < \infty\}$,

To find the inverse function, we will do the next steps:

- write the function as an equation $y = \frac{1}{2-3x}$.
- solve for x : $x = \frac{2y-1}{3y}$
- now write $f^{-1}(y)$ as follows $f^{-1}(y) = \frac{2y-1}{3y}$ or $f^{-1}(x) = \frac{2x-1}{3x}$.
- check: $f(f^{-1}(x)) = \frac{1}{2-3\frac{2x-1}{3x}} = \frac{x}{2x-(2x-1)} = x$.

Inverse function: $g(x) = f^{-1}(x) = \frac{2x-1}{3x}$.