MAC1105 Week 9 Discussion

Module 9: Limits

October 17, 2019

Given $f(x) = x^2 - 4$ and $g(x) = \frac{3}{x + 1}$, answer the following questions:

(a) Determine the domain of the following:

- $f(x)$: $(-\infty, \infty)$
- $g(x)$: $(-\infty, -1) \cup (-1, \infty)$
- $f(x) + g(x)$: $(-\infty, -1) \cup (-1, \infty)$
- $f(x) - g(x)$: $(-\infty, -1) \cup (-1, \infty)$
- $f(x) \cdot g(x)$: $(-\infty, -1) \cup (-1, \infty)$
- $\frac{f(x)}{g(x)}$: $(-\infty, \infty)$
- $\frac{g(x)}{f(x)}$: $(-\infty, -2) \cup (-2, -1) \cup (-1, 2) \cup (2, \infty)$

(b) Determine the value of the following:

- $(f \circ g)(3)$ Answer: $f(g(3)) = f\left(\frac{3}{4}\right) = -\frac{55}{16} = -3.4375$
- $(g \circ f)(3)$ Answer: $g(f(3)) = g\left(\frac{5}{2}\right) = 0.5$

In general, does $(f \circ g)(x) = (g \circ f)(x)$? Answer: In general, no.

(c) Is $f(x) = x^2 - 4$ a one-to-one function? If yes, find its inverse and determine the domain of $f^{-1}(x)$.

Answer: $f(x)$ is not one-to-one, so no need to find its inverse.

(d) Is $g(x) = \frac{3}{x + 1}$ a one-to-one function? If yes, find its inverse and determine the domain of $g^{-1}(x)$.

Answer: $g(x)$ is one-to-one. $g^{-1}(x) = \frac{x}{3} - 1$, domain of $g^{-1}(x)$: $(\infty, 0) \cup (0, \infty)$