

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:

$$f(x), g(x), f(x) + g(x), f(x) - g(x), f(x) * g(x), \frac{f(x)}{g(x)}, \frac{g(x)}{f(x)}$$

Answer $f(x) : (-\infty, \infty)$

Answer $g(x) : (-\infty, -1) \cup (-1, \infty)$

Answer $f(x) + g(x) : (-\infty, -1) \cup (-1, \infty)$

Answer $f(x) - g(x) : (-\infty, -1) \cup (-1, \infty)$

Answer $f(x) * g(x) : (-\infty, -1) \cup (-1, \infty)$

Answer $\frac{f(x)}{g(x)} : (-\infty, \infty)$

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

(b) Determine the value of the following:

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

$$(g \circ f)(3) \text{ **Answer:** } g(f(3)) = g(5) = \frac{1}{2} = 0.5$$

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