Section 2.3: Composition of Functions

Monday, January 19, 2015
12:57 PM

Composition of functions:

the composite function $f \circ g$

"f circle g"
"f composed with g"
"the composition of f and g"

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

example: let $f(x) = \sqrt{x}$ domain: $\{x \mid x \geq 0\}$
$g(x) = x+3$ domain: $\mathbb{R}$

then find $(f \circ g)(x)$ and $(g \circ f)(x)$
and their domains

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

$(f \circ g)(x) = \sqrt{g(x)}$

$= \sqrt{x+3}$

$(f \circ g)(x) = f(x+3)$

$= \sqrt{x+3}$

domain: $\{x \mid x \geq -3\}$

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

$= g(\sqrt{x})$

$= \sqrt{x} + 3$ domain: $\{x \mid x \geq 0\}$

---

example: let $f(x) = \frac{1}{x-2}$ and $g(x) = \sqrt{x}$

find $(f \circ g)(x)$ and $(g \circ f)(x)$ and their domains

$(f \circ g)(x) = f(\sqrt{x})$

$= \frac{1}{\sqrt{x}-2}$

domain:

$\{x \mid x \neq 4 \text{ and } x \geq 0\}$

$[0, 4) \cup (4, \infty)$

$(g \circ f)(x) = \sqrt{\frac{1}{x-2}}$

$= \frac{1}{\sqrt{x-2}}$

domain:

$\{x \mid x > 2\}$

$(2, \infty)$

decomposition of functions:

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

if $h(x) = \sqrt{2x^2+5}$, then list possible sets of f & g that make this work

$\begin{cases} f(x) = \sqrt{x} \\ g(x) = 2x^2+5 \end{cases}$

$\begin{cases} f(x) = \sqrt{x+5} \\ g(x) = 2x^2 \end{cases}$

$\begin{cases} f(x) = \sqrt{2x+5} \\ g(x) = x^2 \end{cases}$

$\begin{cases} f(x) = \sqrt{2(x-157)^2+5} \\ g(x) = x+157 \end{cases}$