

Math 1314 – College Algebra

Section 3.4 Function Composition

Function Arithmetic:

The domain of each function, unless otherwise restricted, is the set of real numbers x that are in the domains of f and g .

$$\blacksquare (f + g)(x) = f(x) + g(x) \quad \blacksquare (f - g)(x) = f(x) - g(x) \quad \blacksquare (fg)(x) = f(x)g(x) \quad \blacksquare \left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, g(x) \neq 0$$

Ex: Suppose $f(x) = 3x - 1$ and $g(x) = 2x - 6$. Find each function and its domain.

(a) $(f + g)(x)$

(b) $(fg)(x)$

Ex: Let $f(x) = \sqrt{x+2}$ and $g(x) = x^2 + 5$. Find $\left(\frac{g}{f}\right)(x)$ and its domain.

Ex: If $f(x) = \frac{x+3}{x-2}$ and $g(x) = \frac{2}{x}$, find $(f - g)(x)$ and its domain.

Ex: Let $f(x) = \sqrt{x+1}$ and $g(x) = x - 4$. Find $(f - g)(11)$

■ Composition of functions: $(f \circ g)(x) = f(g(x))$

Domain:

Ex: If $f(x) = \frac{x+3}{x-2}$ and $g(x) = \frac{2}{x}$, find

(a) $f(5)$

(b) $f(-3)$

(c) $f(0)$

(d) $f(\star)$

(e) $(f \circ g)(x)$ and its domain.

(f) $(g \circ g)(x)$ and its domain.

Ex: Let f be the function defined by $f = \{(-3, 1), (-2, 2), (-1, 1), (0, 9), (1, 8), (2, 9), (3, -3)\}$ and let g be the function defined $g = \{(-3, -4), (-2, 3), (-1, -6), (0, 8), (1, -6), (2, 5), (3, 2)\}$.

Find $(f \circ g)(-2)$ if it exists.

Ex: If a rack of winter clothing is marked 30% off and you have a coupon for an additional 20% off, find a price function $P(x)$ giving the final price you pay on an item that originally costs $\$x$.

Ex: Let $f(x) = \sqrt{x+1}$ and $g(x) = x - 4$. Find

(a) $f(7)$

(b) $f(11)$

(c) $f(-1)$

(d) $f(\star)$

(e) $(f \circ g)(x)$ and its domain

(f) $(g \circ f)(x)$ and its domain

Ex: Find functions f and g such that $h = f \circ g$.

(a) $h(x) = \sqrt[3]{x^2 - 2x + 5}$

(b) $h(x) = \frac{1}{(x-3)^5} + (x-3)^5$

Ex: The number of cars running in the business district of a town at time t is given by $f(t)$. Carbon monoxide pollution coming from these cars is given by $g(x)$ parts per million, where x is the number of cars being operated in the district. What does the function $(g \circ f)(t)$ represent?