

1.4 Building Functions From Functions

Part I - 4 Basic Operations
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Let f and g be functions with intersecting domains, then for all values x in the intersection are defined below:

$$\text{Sum: } (f+g)(x) \Leftrightarrow f(x) + g(x)$$

$$\text{Difference: } (f-g)(x) \Leftrightarrow f(x) - g(x)$$

$$\text{Product: } (f \cdot g)(x) \Leftrightarrow f(x) \cdot g(x)$$

$$\text{Quotient: } \left(\frac{f}{g}\right)(x) \Leftrightarrow \frac{f(x)}{g(x)}, \text{ given } g(x) \neq 0$$

Ex 1

$$\text{Let } f(x) = 3x + 4 \text{ and } g(x) = -2x^2 - 4$$

$$1) \text{ find } (f+g)(x)$$

$$= f(x) + g(x)$$

$$(3x+4) + (-2x^2-4)$$

$$3x - 2x^2$$

$$(f+g)(x) = -2x^2 + 3x$$

$$2) \text{ find } (f+g)(3)$$

$$-2(3)^2 + 3(3)$$

$$-2(9) + 9$$

$$-18 + 9$$

$$(f+g)(3) = -9$$

Ex 2

$$\text{Let } f(t) = t^2 + 2t \text{ and } g(t) = 4t + 4$$

$$1) \text{ Find } (g-f)(t)$$

$$= g(t) - f(t)$$

$$(4t+4) - (t^2+2t)$$

$$4t+4 - t^2-2t$$

$$(g-f)(t) = -t^2 + 2t + 4$$

$$2) \text{ Find } (g-f)(-8)$$

$$g(-8)$$

$$4(-8)+4$$

$$-28$$

$$(g-f)(-8) = -76$$

$$f(-8)$$

$$(-8)^2 + 2(-8)$$

$$48$$

$$-28 - 48$$

EX 3 Let $f(x) = x^2$, $g(x) = \sqrt{x+1}$

Find $(f+g)(x)$, $(f-g)(x)$, $(f \cdot g)(x)$ and $(\frac{f}{g})(x)$

①

②

③

④

① ANS

$$(f+g)(x) = x^2 + \sqrt{x+1}$$

$$x^2: (-\infty, \infty)$$

$$\sqrt{x+1}: [-1, \infty)$$

SHARED DOMAIN

$$[-1, \infty)$$

③ $(f \cdot g)(x)$

$$= x^2 \cdot \sqrt{x+1}$$

$$\text{Domain: } [-1, \infty)$$

② ANS

$$(f-g)(x) = x^2 - \sqrt{x+1}$$

$$\text{Domain: } [-1, \infty)$$

$$④ \left(\frac{f}{g}\right)(x) = \frac{x^2}{\sqrt{x+1}}$$

$$x+1 > 0$$

$$\text{Domain: } (-1, \infty)$$