

1.5: Function operations & Inverses

$$1) (f+g)(x) = f(x) + g(x)$$

$$2) (f-g)(x) = f(x) - g(x)$$

$$3) (f \cdot g)(x) = f(x) \cdot g(x)$$

$$4) \left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$$

Ex 1) $f(x) = 4x + 8$ & $g(x) = 2x - 12$, find:

$$\begin{aligned} a) (f+g)(x) &= f(x) + g(x) \\ &= 4x + 8 + 2x - 12 \\ &= 6x - 4 \end{aligned}$$

$$\begin{aligned} b) (g-f)(x) &= g(x) - f(x) \\ &= 2x - 12 - (4x + 8) \\ &= 2x - 12 - 4x - 8 \\ &= -2x - 20 \end{aligned}$$

$$\begin{aligned} c) (f \cdot g)(x) &= f(x) \cdot g(x) \\ &= (4x + 8)(2x - 12) \\ &= 8x^2 - 48x + 16x - 96 \\ &= 8x^2 - 32x - 96 \end{aligned}$$

$$\begin{aligned} d) \left(\frac{f}{g}\right)(x) &= \frac{f(x)}{g(x)} \\ &= \frac{4x + 8}{2x - 12} \end{aligned}$$

INVERSE \rightarrow opposite
 \rightarrow undoes something
 \rightarrow Left \rightarrow right
 \rightarrow multiplication \rightarrow division

Properties of Inverses

- 1) switch x & y
- 2) domain & range switch places
- 3) reflect over $y = x$
- 4) Equations \rightarrow switch x & y
 \rightarrow solve for y
 \rightarrow notation: y^{-1} or $f^{-1}(x)$

EX 2) $f(x) = \{(1, 3), (2, -2), (4, 0)\}$

$f^{-1}(x) = \{(3, 1), (-2, 2), (0, 4)\}$

EX 3) $y = 8 - 3x$
 $x = 8 - 3y$

$$\frac{x-8}{-3} = \frac{-3y}{-3}$$

$$y^{-1} = \frac{x-8}{-3}$$

EX 4) $y = 3x^2 - 5$

$$x = 3y^2 - 5$$

$$\frac{x+5}{3} = \frac{3y^2}{3}$$

$$\pm \sqrt{\frac{x+5}{3}} = \pm \sqrt{y^2}$$

$$y^{-1} = \pm \sqrt{\frac{x+5}{3}}$$