

1.6: Compositions of Functions

$$(f \circ g)(x) \rightarrow f(g(x)) \quad \text{"f of g of x"}$$

- putting one function into another function

* NOT multiplication!!!

Given $f(x) = x^2 + 1$ $g(x) = x + 1$, find:

Ex 1) $(f \circ g)(-2) = f(g(-2))$ * inside \rightarrow outside

$$= f(-2 + 1)$$

$$= f(-1)$$

$$= (-1)^2 + 1$$

$$= \boxed{2}$$

Ex 2) $(g \circ f)(-2) = g(f(-2))$

$$= g((-2)^2 + 1)$$

$$= g(5)$$

$$= 5 + 1$$

$$= \boxed{6}$$

you try: $(g \circ g)(1)$

Given $f(x) = x - 1$ & $g(x) = x^2$, find:

$$\text{Ex 3) } (f \circ g)(x) = f(g(x))$$

$$= f(x^2)$$

$$= \boxed{x^2 - 1}$$

$$\text{Ex 4) } (g(f(x))) = g(x - 1)$$

$$= (x - 1)^2$$

$$= (x - 1)(x - 1)$$

$$| x^2 - x - x + 1$$

$$x^2 - 2x + 1$$

Given $f(x) = x + 6$ & $g(x) = 3x - 4$ find

$$\text{Ex 5) } f(g(x)) = f(3x - 4)$$

$$= (3x - 4) + 6$$

$$= 3x - 4 + 6$$

$$= \boxed{3x + 2}$$

you try: $g(f(x))$

$f(f(x))$

Given $f(x) = x^2 + x - 3$ } $g(x) = x + 5$

Ex 6) $(f \circ g)(x) = f(\underline{g(x)})$

$$= f(x + 5)$$

$$= (x + 5)^2 + (x + 5) - 3$$

$$= (x + 5)(x + 5) + x + 5 - 3$$

$$= x^2 + 5x + 5x + 25 + x + 2$$

$$= \boxed{x^2 + 11x + 27}$$