

functions \rightarrow a one to one relationship

function notation -

$$f(x) = x^2$$

$$f(3) = (3)^2$$

$$f(-2) = (-2)^2$$

$$f(a) = a^2$$

$$f(x+2) = (x+2)^2$$

Composite functions

$$f(x) = 3x \quad g(x) = 1 + x^2$$

$$(f + g)(x) = (3x) + (1 + x^2)$$

$$(f - g)(x) = (3x) - (1 + x^2)$$

$$(fg)(x) = (3x)(1 + x^2)$$

$$(f/g)(x) = 3x / 1 + x^2$$

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

f composed of g

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

$$f(x) = 3x \quad g(x) = 1 + x^2$$

$$\begin{aligned}(f \circ g)(x) &= f(g(x)) \\ &= f(1 + x^2) \\ &= 3(1 + x^2) \\ &= 3 + 3x^2\end{aligned}$$

$$f(x) = x^2 + 1$$

$$f(x-3) = (x-3)^2 + 1$$

$$f(2x^2+5) = (2x^2+5)^2 + 1$$

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

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

$$f(x) = 3x$$

$$f(1+x^2) = 3(1+x^2)$$

$$f(x) = 3x^2 - 2x \quad g(x) = x^2$$

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

$$\begin{aligned} f(x^2) &= 3(x^2)^2 - 2(x^2) \\ &= 3x^4 - 2x^2 \end{aligned}$$

$$f(x) = \frac{1}{2}x^2 + 3 \quad g(x) = x + 2$$

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

$$\begin{aligned} \underline{\underline{f(x+2)}} &= \frac{1}{2}(x+2)^2 + 3 \\ &= \frac{1}{2}(x^2 + 4x + 4) + 3 \\ &= \frac{1}{2}x^2 + 2x + 2 + 3 \\ &= \frac{1}{2}x^2 + 2x + 5 \end{aligned}$$

$$f(x) = \frac{1}{2}x^2 + 3 \quad g(x) = x + 2$$

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

$$g\left(\frac{1}{2}x^2 + 3\right) = \left(\frac{1}{2}x^2 + 3\right) + 2 \\ = \frac{1}{2}x^2 + 5$$

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

$$\begin{aligned}(f \circ g)(x) &= f(g(x)) \\ f(x^2 - 1) &= \sqrt{(x^2 - 1) + 1} \\ &= \sqrt{x^2} = x\end{aligned}$$

$$\begin{aligned}(g \circ f)(x) &= g(f(x)) \\ g(\sqrt{x+1}) &= (\sqrt{x+1})^2 - 1 \\ &= x + 1 - 1 \\ &= x\end{aligned}$$

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

$$f(x) = x^2 \quad g(x) = 3x + 5$$

$$(f \circ g)(x) = f(3x + 5)$$
$$(3x + 5)^2$$

$$f(x) = (x + 5)^2 \quad g(x) = 3x$$

$$f(x) = 2x + 4 \quad g(x) = x^2 - 1$$

$$\begin{aligned}(f \circ g)(x) &= 2(x^2 - 1) + 4 \\ &= 2x^2 - 2 + 4 \\ &= 2x^2 + 2\end{aligned}$$

$$\begin{aligned}(f \circ g)(1) &= 2(1)^2 + 2 \\ &= 2 + 2 \\ &= 4\end{aligned}$$

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