1.2 Part 2

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Exp $\boxed{f(x) = 3x - 2}$ Find

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$m = 3$

$f'(x) = 3$

1. $f(0) = 3(0) - 2 = 0 - 2 = -2$
2. $f(1) = 3(1) - 2 = 3 - 2 = 1$
3. $f\left(-\frac{5}{3}\right) = \cancel{3}\left(-\frac{5}{\cancel{3}}\right) - 2 = -5 - 2 = -7$
4. $f(1+h) = 3(1+h) - 2 = 3 + 3h - 2 = 1 + 3h$
5. $\frac{f(1+h) - f(1)}{h} = \frac{\cancel{1} + 3h - \cancel{1}}{h} = \frac{3\cancel{h}}{\cancel{h}} = 3, \quad h \neq 0$

Operations with Function

Given f and g be any functions of x

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. $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, \quad g(x) \neq 0$

Exp $f(x) = \sqrt{x}$, $g(x) = x^2 - 1$ Find

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① $(f+g)(4) = f(4) + g(4)$
$= \sqrt{4} + (4^2 - 1)$
$= 2 + (16 - 1)$
$= 17$

② $(f \cdot g)(1) = f(1) \cdot g(1)$
$= \sqrt{1} \cdot (1^2 - 1)$
$= 1 \cdot 0$
$= 0$

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

③ $\left(\frac{f}{g}\right)(4) = \frac{f(4)}{g(4)} = \frac{\sqrt{4}}{4^2-1} = \frac{2}{16-1} = \frac{2}{15}$

④ $(f \cdot f)(4) = f(4) \cdot f(4) = \sqrt{4} \cdot \sqrt{4} = 2 \cdot 2 = 4$

Composition

f and g any functions

The composition function g of f is

$$\underset{\text{circle}}{(g \circ f)}(x) = g(f(x))$$

The composition function f of g

circle

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

Exp $f(x) = 1 - 2x$, $g(x) = 3x^2$ Find

① $(g - f)(x) = g(x) - f(x)$

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

$= 3x^2 - 1 + 2x$

$= 3x^2 + 2x - 1$

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

$= 3 \cdot 1 + 2 - 1$

$= 3 + 2 - 1$

$= 4$

② $(f \cdot g)(1) = f(1) \cdot g(1)$

$= (1 - 2(1)) \cdot 3(1)^2$

-1

$= (1 - 2) \cdot 3$

$= -1 \cdot 3$

$= -3$

$f(x) = 1 - 2x$

$g(x) = 3x^2$

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

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

$= 1 - 6x^2$

④ $(f \circ g)(0) = \underbrace{1 - 6 \cdot (0)^2}_{x} = 1 - 0 = 1$

$f(x) = 1 - 2x$

$g(x) = 3x^2$

⑤ $(g \circ f)(x) = g(f(x)) = g(1 - 2x)$

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

⑥ $(g \circ f)(0) = 3(1 - 2(0))^2 = 3(1-0)^2 = 3(1)^2 = 3$

ليس دائماً

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

$f(x) = 1 - 2x$

$g(x) = 3x^2$

⑦ $(f \circ f)(x) = f(f(x)) = f(1 - 2x)$

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

$= 1 - 2 + 4x$

$= -1 + 4x$

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$$f(x) = 3x^2 - 5x + 1$$

$$f(1) = 3(1)^2 - 5(1) + 1 = 3 - 5 + 1 = -1$$

$$f(2) = 3(2)^2 - 5(2) + 1 = 3(4) - 10 + 1 = 3$$

$$f(\text{جذ}) = 3(\text{جذ})^2 - 5(\text{جذ}) + 1 = \cdots$$

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