

## Review Binomial Expansion

$$\textcircled{1} \left(\frac{a}{b} + a\right)^3 \quad x = \frac{a}{b} \quad y = a \quad n = 3$$

$$\binom{3}{0} \left(\frac{a}{b}\right)^3 (a)^0 + \binom{3}{1} \left(\frac{a}{b}\right)^2 (a)^1 + \binom{3}{2} \left(\frac{a}{b}\right)^1 (a)^2 + \binom{3}{3} \left(\frac{a}{b}\right)^0 (a)^3$$

$$(1) \left(\frac{a^3}{b^3}\right)(1) + (3) \left(\frac{a^2}{b^2}\right)(a) + (3) \left(\frac{a}{b}\right)(4) + (1)(1)(8)$$

$$\boxed{\frac{a^3}{b^3} + \frac{6a^2}{b^2} + \frac{12a}{b} + 8}$$

∴

## Review Composite Functions

② Suppose  $f(x) = x^2 - 3x + 5$  and  $g(x) = 2x - 3$

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

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

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

$$f(2x-3) = 4x^2 - 12x + 9 - 6x + 9 + 5$$

$$f(2x-3) = 4x^2 - 18x + 23$$

composed with

b) find  $g(f(x))$

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

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

$$g(x^2 - 3x + 5) = 2x^2 - 6x + 10 - 3$$

$$g(x^2 - 3x + 5) = 2x^2 - 6x + 7$$

c) find  $f(g(3))$

$$(i) g(3) = 2(3) - 3$$

$$g(3) = 6 - 3$$

$$g(3) = 3$$

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

$$f(3) = 9 - 9 + 5$$

$$\boxed{f(3) = 5}$$

d) find  $g(f(-1))$

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

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

$$f(-1) = 9$$

$$(ii) g(9) = 2(9) - 3$$

$$g(9) = 18 - 3$$

$$\boxed{g(9) = 15}$$

## Review Combining Functions

③ Suppose:  $f(x) = (x+2)^2 - 3$ ,  $g(x) = 3x+1$ ,  $h(x) = \sqrt{x+5}$

a) find  $(f \cdot g)(x)$  and state its domain.

b) find  $(h-g)(x)$  and state its domain.

c) find  $\left(\frac{f}{h}\right)(x)$  and state its domain.

$f(x) = (x+2)^2 - 3$	$g(x) = 3x+1$	$h(x) = \sqrt{x+5}$
$f(x) = x^2 + 4x + 4 - 3$	$\swarrow$ (degree 1)	$\curvearrowright$ (radical)
$f(x) = x^2 + 4x + 1$	D: $\{x \mid x \in \mathbb{R}\}$	$x+5 \geq 0$
$\cup$ (degree 2)		$x \geq -5$
D: $\{x \mid x \in \mathbb{R}\}$		D: $\{x \mid x \geq -5, x \in \mathbb{R}\}$

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

$$(f \cdot g)(x) = (x^2 + 4x + 1)(3x + 1)$$

$$(f \cdot g)(x) = 3x^3 + x^2 + 12x^2 + 4x + 3x + 1$$

$$(f \cdot g)(x) = 3x^3 + 13x^2 + 7x + 1 \quad \swarrow \text{(degree 3)}$$

$$D: \{x \mid x \in \mathbb{R}\}$$

b)  $(h-g)(x) = h(x) - g(x)$

$$(h-g)(x) = \sqrt{x+5} - (3x+1)$$

$$(h-g)(x) = \sqrt{x+5} - 3x - 1$$

$$D: \{x \mid x \geq -5, x \in \mathbb{R}\}$$

c)  $\left(\frac{f}{h}\right)(x) = \frac{f(x)}{h(x)}$

$$\left(\frac{f}{h}\right)(x) = \frac{x^2 + 4x + 1}{\sqrt{x+5}} \rightarrow \sqrt{x+5} \neq 0$$

$$x+5 \neq 0$$

$$x \neq -5$$

$$D: \{x \mid x > -5, x \in \mathbb{R}\}$$