SEC 3.6 COMBINING FUNCTIONS

1. ADD FUNCTION: $(f+g)(x) = f(x) + g(x)$ DOMAIN: $A \cap B$

EX. $f(x) = x^2 - 3$ DOMAIN: $(-\infty, \infty)$ $\quad g(x) = 2x - 5$ DOMAIN: $(-\infty, \infty)$

$(f+g)(x) = (x^2 - 3) + (2x - 5) = \boxed{x^2 + 2x - 8}$

DOMAIN: $(-\infty, \infty)$

2. SUBTRACT FUNCTIONS: $(f-g)(x) = f(x) - g(x)$ DOMAIN: $A \cap B$

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

$x^2 - 3 \quad -2x + 5$

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

DOMAIN: $(-\infty, \infty)$

3. MULTIPLY FUNCTIONS: $(fg)(x) = f(x) \cdot g(x)$ DOMAIN: $A \cap B$

EX. $(fg)(x) = (x^2 - 3)(2x - 5)$

$\boxed{2x^3 - 5x^2 - 6x + 15}$

DOMAIN: $(-\infty, \infty)$

4. DIVIDE FUNCTIONS: $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$ DOMAIN: $\{x \in A \cap B \mid g(x) \neq 0\}$

EX. $\dfrac{x^2 - 3}{2x - 5}$

DOMAIN: $(-\infty, \frac{5}{2}) \cup (\frac{5}{2}, \infty)$

$2x - 5 \neq 0$

$+5 \quad +5$

$\frac{2}{2}x = 5/2$

5. COMPOSITION OF FUNCTIONS:

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

↑ GET ↑ INSERT FOR x

EX. $f(x) = x^2 - 3$ $\quad g(x) = 2x - 5$

$x^2 - 3$

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

$(2x-5)(2x-5) - 3$

$4x^2 - 20x + 25 - 3$

$\boxed{4x^2 - 20x + 22}$

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

↑ GET ↑ INSERT

$2x - 5$

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

$2x^2 - 6 - 5 = \boxed{2x^2 - 11}$

EX. $(g \circ g)(-2)$

GET ↑ INSERT ↑

$2x-5$

$2(-2)-5$

$-4-5$

$\boxed{-9}$

$2x-5$

$2(2x-5)-5$

$4x-10-5$

$4x-15$

$4(-2)-15$

$-8-15$

$\boxed{-23}$

$2(-9)-5$

$-18-5$

$\boxed{-23}$

#3 $f(x) = \sqrt{1+x^2}$ DOMAIN: $(-\infty, \infty)$

$g(x) = \sqrt{1-x}$ DOMAIN: $(-\infty, 1]$

a) $(f+g)(x) = \sqrt{1+x^2} + \sqrt{1-x}$ $(-\infty, 1]$

b) $(f-g)(x) = \sqrt{1+x^2} - \sqrt{1-x}$ $(-\infty, 1]$

c) $(fg)(x) = \sqrt{1+x^2} \cdot \sqrt{1-x}$

$\sqrt{(1+x^2)(1-x)}$

$\sqrt{1-x+x^2-x^3}$ $(-\infty, 1]$

d) $\left(\frac{f}{g}\right)(x) = \frac{\sqrt{1+x^2}}{\sqrt{1-x}} = \sqrt{\frac{1+x^2}{1-x}}$ $(-\infty, 1)$

#19 $f(x) = 3x - 5$ $g(x) = 2 - x^2$

a) $(f \circ g)(-2)$

$2 - (-2)^2$

$2 - 4$

-2

$3(-2) - 5$

$-6 - 5$

$\boxed{-11}$

b) $(g \circ f)(-2)$

$3(-2) - 5$

$-6 - 5$

-11

$2 - (-11)^2$

$2 - 121$

$\boxed{-119}$