***AAT**

Name: Key

Chapter 3: 3-7 Operations on Functions (IC/HW)-Day 1

Date: _____ Period: _____

Find (a) (f+g)(3) (b) (f-g)(3) (c) (fg)(3) (d) (f/g)(3)

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

$f(3)+g(3) = 6+9 = 15$

$f(3)-g(3) = 6-9 = -3$

$f(3)\cdot g(3) = 6\cdot 9 = 54$

$f(3)/g(3) = 6/9 = \frac{2}{3}$

2. $f(x) = -x^2$; $g(x) = 2x - 1$

$f(3)+g(3) = -9+5 = -4$

$f(3)-g(3) = -9-5 = -14$

$f(3)\cdot g(3) = -9\cdot 5 = -45$

$f(3)/g(3) = -9/5$

Find

(a) (f+g)(x), (f-g)(x), (fg)(x), (f/g)(x)

(b) the domain of f+g, f-g, and fg

(c) the domain of f/g

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

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

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

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

$\frac{f(x)}{g(x)} = \frac{x^2+2}{2x^2-1}$; domain: All R's except $\pm\frac{\sqrt{2}}{2}$

domain: All Reals

4. $f(x) = \sqrt{x+5}$, $g(x) = \sqrt{x+5}$

$f(x)+g(x) = \sqrt{x+5}+\sqrt{x+5} = 2\sqrt{x+5}$

$f(x)-g(x) = \sqrt{x+5}-\sqrt{x+5} = 0$

$f(x)\cdot g(x) = (\sqrt{x+5})(\sqrt{x+5}) = x+5$

$\frac{f(x)}{g(x)} = \frac{\sqrt{x+5}}{\sqrt{x+5}} = 1$

domain: $(-5, \infty)$

domain: $[-5, \infty)$

5. $f(x) = \frac{2x}{x-4}$, $g(x) = \frac{x}{x+5}$

(b) domain: All R's except 4, -5

$\frac{2x}{x-4}+\frac{x}{x+5} = \frac{2x(x+5)+x(x-4)}{(x-4)(x+5)} = \frac{3x^2+6x}{(x-4)(x+5)}$

$\frac{2x}{x-4}-\frac{x}{x+5} = \frac{x^2+14x}{(x-4)(x+5)}$

$\frac{2x}{x-4}\cdot\frac{x}{x+5} = \frac{2x^2}{(x-4)(x+5)}$

$\frac{2x/(x-4)}{x/(x+5)} = \frac{2x}{x-4}\cdot\frac{x+5}{x} = \frac{2(x+5)}{(x-4)}$

Find

(a) (f ∘ g)(x) (b) (g ∘ f)(x) (c) (f ∘ f)(x) (d) (g ∘ g)(x)

6. $f(x) = 2x - 1$, $g(x) = -x^2$

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

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

$f(f(x)) = f(2x-1) = 2(2x-1)-1 = 4x-2-1 = 4x-3$

$g(g(x)) = g(-x^2) = -(-x^2)^2 = -x^4$

7. $f(x) = 3x^2$, $g(x) = x - 1$

$f(g(x)) = f(x-1) = 3(x-1)^2 = 3x^2-6x+3$

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

$f(f(x)) = f(3x^2) = 3(3x^2)^2 = 3(9x^4) = 27x^4$

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

domain: All R's except $-5, 0, \pm 4$

Find

(a) $(f \circ g)(x)$ (b) $(g \circ f)(x)$ (c) $f(g(-2))$ (d) $g(f(3))$

3. $f(x) = 2x - 5$, $g(x) = 3x + 7$

$f(g(x)) = f(3x+7) = 2(3x+7) - 5 = 6x + 9$

$g(f(x)) = g(2x-5) = 3(2x-5) + 7 = 6x - 8$

$f(g(-2)) = f(3(-2)+7) = f(1) = 2(1) - 5 = -3$

$g(f(3)) = g(2(3)-5) = g(1) = 3(1) + 7 = 10$

9. $f(x) = 3x^2 + 4$, $g(x) = 5x$

$f(g(x)) = f(5x) = 3(5x)^2 + 4 = 75x^2 + 4$

$g(f(x)) = g(3x^2+4) = 5(3x^2+4) = 15x^2 + 20$

$f(g(-2)) = f(5 \cdot (-2)) = f(-10) = 3(-10)^2 + 4$

$= 304$

$g(f(3)) = g(3(3^2)+4) = g(31) = 5(31)$

$= 155$

10. $f(x) = 2x^2 + 3x - 4$, $g(x) = 2x - 1$

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

$= 8x^2 - 2x - 5$

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

$= 4x^2 + 6x - 9$

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

$= 50 - 15 - 4 = 31$

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

$= 2(23) - 1 = 45$

11. $f(x) = 4x$, $g(x) = 2x^3 - 5x$

$f(g(x)) = f(2x^3 - 5x) = 4(2x^3 - 5x)$

$= 8x^3 - 20x$

$g(f(x)) = g(4x) = 2(4x)^3 - 5(4x)$

$= 128x^3 - 20x$

$f(g(-2)) = f(2(-2)^3 - 5(-2)) = f(-6)$

$= 4(-6) = -24$

$g(f(3)) = g(4(3)) = 2(12)^3 - 5(12)$

$= 3456 - 60$

$= 3396$

Solve the equation $(f \circ g)(x) = 0$

12. $f(x) = x^2 - 2$, $g(x) = x + 3$

$f(g(x)) = f(x+3) = (x+3)^2 - 2 = 0$

$= \sqrt{(x+3)^2} = \sqrt{2}$

$= x + 3 = \pm\sqrt{2}$

$x = -3 \pm \sqrt{2}$

13. $f(x) = x^2 - x - 2$, $g(x) = 2x - 1$

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

$4x^2 - 6x = 0$

$2x(2x-3) = 0$

$x = 0, \quad x = \frac{3}{2}$