Name *Answer Key*

PreCalculus; Sec 1.5a – Combinations of Functions

For each function, find (a) $(f+g)(x)$, (b) $(f-g)(x)$, (c) $(fg)(x)$, and (d) $(f/g)(x)$. Write the domain of f/g in <u>set-builder notation</u>.

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

a) $(f+g)(x) = 2x$

b) $(f-g)(x) = 6$

c) $(fg)(x) = x^2 - 9$

d) $\left(\frac{f}{g}\right)(x) = \frac{x+3}{x-3},\ x \neq 3$

D: $\{x \mid x \neq 3\}$

2. $f(x) = x^2 + 5$, $g(x) = \sqrt{1-x}$

a) $(f+g)(x) = x^2 + 5 + \sqrt{1-x}$

b) $(f-g)(x) = x^2 + 5 - \sqrt{1-x}$

c) $(fg)(x) = (x^2+5)\sqrt{1-x}$

d) $\left(\frac{f}{g}\right)(x) = \frac{x^2+5}{\sqrt{1-x}},\ x \leq 1$

D: $\{x \mid x \leq 1\}$

Evaluate the indicated function for $f(x) = x^2 - 1$ and $g(x) = x - 2$.

3. $(f+g)(3)$

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

$= 9 - 1 + 3 - 2$

$\boxed{= 9}$

4. $(fg)(-4)$

$= [(-4)^2 - 1][(-4) - 2]$

$= 15(-6)$

$\boxed{= -90}$

Find (a) $f \circ g$, (b) $g \circ f$, and, if possible, (c) $(f \circ g)(0)$.

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

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

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

c) $f(g(0)) = 1$

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

a) $f(g(x)) = 3(5-x) + 5 = 20 - 3x$

b) $g(f(x)) = 5 - (3x+5) = -3x$

c) $f(g(0)) = 20$

Determine the domains of (a) f, (b) g, and (c) $f \circ g$.

7. $f(x) = \sqrt{x+4}$, $g(x) = x^2$

a) D: $[-4, +\infty)$

b) D: $(-\infty, +\infty)$

c) D: $(-\infty, +\infty)$

8. $f(x) = |x - 4|$, $g(x) = 3 - x$

a) D: $(-\infty, +\infty)$

b) D: $(-\infty, +\infty)$

c) D: $(-\infty, +\infty)$

9. A company owns two retail stores. The annual sales (in thousands of dollars) of the stores each year from 2004 through 2010 can be approximated by the models

$$S_1 = 830 + 1.2t^2 \text{ and } S_2 = 390 + 75.4t$$

where t is the year, with $t = 4$ corresponding to 2004.

(a) Write a function T that represents the total annual sales of the two stores.

$T = S_1 + S_2$

$T(t) = 1220 + 75.4t + 1.2t^2$

(b) How much money did the stores make during 2007?

$t = 7$

$T(7) = 1220 + 75.4(7) + 1.2(7)^2 = \boxed{\$1806.6 \text{ THOUSAND}}$

10. The spread of a contaminant is increasing in a circular pattern on the surface of a lake. The radius of the contaminant can be modeled by $r(t) = 5.25\sqrt{t}$, where r is the radius in meters and t is the time in hours since contamination.

(a) Find a function that gives the area A of the circular leak in terms of the time t since the spread began.

$A(t) = \pi r^2 = \pi\left[5.25\sqrt{t}\right]^2$

$\boxed{= 27.5625\pi t}$

(b) Find the size of the contaminated area after 36 hours.

$A(36) = 27.5625\pi(36)$

$\boxed{= 3117.25 \text{ m}^2}$

(c) Find when the size of the contaminated area is 6250 square meters.

$6250 = 27.5625\pi t$

$t = 72.18$

$\boxed{\text{AFTER 72 HOURS}}$