

Section 1.4

Section Objectives:

- Be able to add, subtract, multiply and divide functions and determine the domain of the resulting function.
- Understand composite functions both algebraically, pictorially and via a table of values.
- Find the domain and range of a composite function.
- Be able to break down a complicated function into simpler pieces using function composition.

Practice Problems

Solutions (Warning: Reading through the solutions is not nearly as effective as working out the problems on your own and then comparing your answers with the solutions.)

1. Let $f(x) = x^2 + 1$ and $g(x) = \sqrt{x+3}$. Find and simplify each of the following. Then state their domain.

(a) $f(x) - g(x)$ (no way to simplify) can't $\sqrt{\text{negative}}$
 $x+3 >, 0$

$$\frac{x^2 + 1 - \sqrt{x+3}}{\text{Domain: } \boxed{x >, -3}}$$

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

$$\frac{(x^2 + 1)\sqrt{x+3}}{\text{or } x^2\sqrt{x+3} + \sqrt{x+3}} \quad \text{Domain: } \boxed{x >, -3}$$

(c) $\frac{g(x)}{f(x)}$ Domain: $x^2 + 1 \neq 0$ for any x , so OK
 need $x+3 >, 0 \Rightarrow$

$$\frac{\sqrt{x+3}}{x^2 + 1} \quad \boxed{x >, -3}$$

(d) $g(f(x))$

$$\sqrt{x^2 + 1 + 3} = \sqrt{x^2 + 4}$$

any x can go into f , then $x^2 + 1$ always $>, -3$, so domain is all real numbers.

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

$$= f(g(x)) = f(\sqrt{x+3})$$

2. Below is a table of function values for two functions f and g . Draw a circle diagram representing x mapping to $g(x)$ and then to $f(g(x))$ (See Figure 1.44 on page 73). Find the domain and image (set of all values that get mapped to) of $f(g(x))$.

x	$f(x)$	$g(x)$
0	1	1
1	2	3
2	3	5
3	7	3
4	2	8
5	1	2
6	9	1

3. Rewrite each function below as a composition of two simpler functions.

(a) $(x + 1)^5 + 3$

(b) $2^{\cos(x)}$

More Practice from Textbook 1.4: You should do as many problems from each set (1-2, 3-10, 11-14, 15-16, 17-22, 23-30, 31-32, 33-42, 43-48), as needed until you are comfortable with these techniques. 33-42 are good practice for more complicated application problems.