

1. Determine if the following functions are even, odd, or neither.

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

(b)  $f(x) = \sin(x)$

(c)  $f(x) = 42$

(d)  $f(x) = x + \sin(x)$

(e)  $f(x) = x^2 - 3\cos(x)$

(f)  $f(x) = x^2 + x + 1$

2. Find the domain of the following functions.

(a)  $f(x) = x$

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

(c)  $f(x) = \sqrt{4-\sqrt{x}}$

(d)  $f(x) = \frac{1}{x} + \frac{1}{x-1} + \frac{1}{x-2} + \cdots + \frac{1}{x-10}$

3. If

$$f(x) = \frac{x^3 - 1}{x - 1}, \quad g(x) = x^2 + x + 1$$

is it true  $f = g$ ?

4. Let  $f(x) = \sqrt{x}$ . Plot the graphs of the following functions. Also describe the domains.

(a)  $y = f(x)$

(b)  $y = f(x+1)$

(c)  $y = 3f(x)$

(d)  $y = f(x) - 3$

(e)  $y = 2f(x-1) + 2$

5. Let

$$f(x) = x + \frac{1}{x}, \quad g(x) = \frac{x+1}{x+2}.$$

Find  $f \circ g$  and  $g \circ f$ . What are the domains of these functions?

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(a) even

(b) odd

(c) even and odd

(d) odd

(e) even

(f) neither

Note that (even) + (even) = (even) and (odd) + (odd) = (even).

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2. Find the domain of the following functions.

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(a) All  $x \in \mathbb{R}$ .

(b)  $x \geq -3$

(c)  $0 \leq x \leq 16$ . All the values in square roots should be nonnegative, which gives  $x \geq 0$  and  $4 - \sqrt{x} \geq 0 \Leftrightarrow x \leq 16$ .

(d) All the values in the denominator should be nonzero. Hence  $x \in \mathbb{R} \setminus \{0, 1, 2, \dots, 10\}$ .

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3. If

$$f(x) = \frac{x^3 - 1}{x - 1}, \quad g(x) = x^2 + x + 1$$

is it true  $f = g$ ?

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No, because  $f(x)$  is not defined at  $x = 1$  but  $g(x)$  is, even they agree on any other  $x \neq 1$ .

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4. Let  $f(x) = \sqrt{x}$ . Plot the graphs of the following functions. Also describe the domains.

- (a)  $y = f(x)$
  - (b)  $y = f(x + 1)$
  - (c)  $y = 3f(x)$
  - (d)  $y = f(x) - 3$
  - (e)  $y = 2f(x - 1) + 2$
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For the graphs, visit the following link: <https://www.desmos.com/geometry/lshqf-much>

- (a)  $x \geq 0$
  - (b)  $x \geq -1$
  - (c)  $x \geq 0$
  - (d)  $x \geq 0$
  - (e)  $x \geq 1$
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5. Let

$$f(x) = x + \frac{1}{x}, \quad g(x) = \frac{x+1}{x+2}.$$

Find  $f \circ g$  and  $g \circ f$ . What are the domains of these functions?

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$$\begin{aligned} (f \circ g)(x) &= f(g(x)) = \frac{x+1}{x+2} + \frac{x+2}{x+1} = \frac{2x^2 + 6x + 5}{(x+2)(x+1)} \\ (g \circ f)(x) &= g(f(x)) = \frac{x + \frac{1}{x} + 1}{x + \frac{1}{x} + 2} = \frac{x^2 + x + 1}{x^2 + 2x + 1} = \frac{x^2 + x + 1}{(x+1)^2} \end{aligned}$$

The domains are  $x \neq -1, -2$  and  $x \neq -1$ , respectively.