

## Guided Work Series Number II

# On Numerca Functions

### Exercse 1.1 (Domain Determination)

Find the domain of definition for the following function:

1.  $f(x) = \frac{\sqrt{x-1}}{x^2-4}$       2.  $g(x) = \sqrt{4-x^2} + \frac{1}{x-1}$       3.  $h(x) = \ln(x+3) + \sqrt{9-x^2}$

### Exercse 1.2 (Parity Analysis)

Determine if the function is even, odd, or neither:

1.  $f(x) = \frac{x^3-x}{x^2+1}$       2.  $g(x) = x^4 - 2x^2 + 5$       3.  $h(x) = x^3 + x^2 + 1$

### Exercse 1.3 (Piecewise Function Analysis)

Given the piecewise functions, evaluate at specified points and analyze:

$$f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ 2x + 1 & \text{if } x \geq 0 \end{cases}, \quad g(x) = \begin{cases} |x| & \text{if } x \leq 1 \\ \sqrt{x-1} & \text{if } x > 1 \end{cases}, \quad h(x) = \begin{cases} \sin x & \text{if } x < 0 \\ \cos x & \text{if } x \geq 0 \end{cases}$$

1. Find  $f(-2)$ ,  $f(0)$ ,  $f(3)$  and sketch the graph.
2. Find  $g(-1)$ ,  $g(1)$ ,  $g(5)$ .
3. Find  $h(-\pi/2)$ ,  $h(0)$ ,  $h(\pi)$ .

### Exercse 1.4 (Function Composition)

1. Given  $f(x) = \sqrt{x}$  and  $g(x) = x^2 + 1$ , find  $(f \circ g)(x)$  and  $(g \circ f)(x)$ , and determine their domains.
2.  $f(x) = \frac{1}{x}$ ,  $g(x) = x - 2$ . Find  $(f \circ g)(x)$  and  $(g \circ f)(x)$ .
3.  $f(x) = \ln x$ ,  $g(x) = e^x$ . Find  $(f \circ g)(x)$  and  $(g \circ f)(x)$ .

**Exercise 1.5** (Limit Calculation)

Evaluate the limit:

1.  $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$

2.  $\lim_{x \rightarrow 0} \frac{\sin(3x)}{x}$

3.  $\lim_{x \rightarrow \infty} \frac{3x^2 - 2x + 1}{2x^2 + 5x - 3}$

**Exercise 1.6** (Continuity Analysis)

1. Determine if the function is continuous at  $x = 1$ :

$$f(x) = \begin{cases} \frac{x^2 - 1}{x - 1} & \text{if } x \neq 1 \\ 3 & \text{if } x = 1 \end{cases}$$

2. Is  $g$  continuous at  $x = 2$ ?

$$g(x) = \begin{cases} x^2 & \text{if } x < 2 \\ 4 & \text{if } x = 2 \\ 2x & \text{if } x > 2 \end{cases}$$

3. Is  $h$  continuous at  $x = 3$ ?

$$h(x) = \frac{1}{x - 3}$$