

PROBLEM SET 1: ELEMENTARY FUNCTIONS

Note: Most of the problems were taken from the textbook [1].

Problem 1. Find the domain of the functions:

a) $g(x) = \sqrt{3-t} - \sqrt{2-t};$

b) $f(u) = \frac{u+1}{1+\frac{1}{u+1}};$

c) $h(x) = \frac{\cos x}{1-\sin x}.$

Problem 2. Find the domain and sketch the graph of the functions:

a) $f(x) = \sqrt{4-x^2};$

b) $h(t) = \frac{t^2-1}{t+1};$

c) $f(x) = \begin{cases} x+1 & \text{if } x \leq -1 \\ x^2 & \text{if } x > -1 \end{cases};$

d) $y = ||x| - 1|.$

Problem 3. Express the area of an equilateral triangle as a function of the length of a side.

Problem 4. Classify each function as a power function, root function, polynomial (state its degree), rational function, algebraic function, trigonometric function, exponential function, or logarithmic function.

a) $f(x) = \log_2 x;$

b) $y = x^2(2-x^3);$

c) $g(\theta) = \tan \theta - \cos^2 \theta;$

d) $y = \pi^x;$

e) $y = \frac{\sqrt{x^3-1}}{1+\sqrt[3]{x}};$

f) $h(z) = x^z;$

$$g) \ y = \frac{s}{e^2 + s}.$$

Problem 5. *What do all the members of the family of linear functions $f(x) = 1 + m(x + 3)$ have in common? Sketch several members of the family.*

Problem 6. *Find an expression for a cubic function f if*

$$f(1) = 6 \quad \text{and} \quad f(-1) = f(0) = f(2) = 0.$$

REFERENCES

- [1] J. Stewart: *Single Variable Calculus* 8th Edition, Cengage Learning, Boston 2015.