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) $y = \big||x| - 1\big|$.

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*

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

References

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