FCS
Math: Functions
Exercises

Massimo Caboara

March 4, 2021

Exercise 1. *Determine the existence fields for the the following "quasi functions" and write down explicitly the associated functions.*

1.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sqrt{\frac{1}{x}} \end{array}$$

2.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sqrt{\frac{x-1}{x}} \end{array}$$

3.
$$\begin{array}{rccc} F: & [0,2\pi) & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sqrt{\sin(x)} \end{array}$$

4.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sqrt{\sin(x)} \end{array}$$

5.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sqrt{\sin(x)\cos(x)} \end{array}$$

6.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sqrt{\sin(x)-1} \end{array}$$

7.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \frac{x^2-1}{(x+1)^2} \end{array}$$

8.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \frac{\sqrt{x^2-2x}}{x^2-3x} \end{array}$$

9.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \log(\mid x \mid) \end{array}$$

10.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \log(\sin(x)) \end{array}$$

Exercise 2. *After determinig the existence field of the "quasi functions", draw the graph of the associated functions*

1.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & 2^x + 1 \end{array}$$

2.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \left(\frac{1}{3}\right)^x \end{array}$$

3.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sqrt{\sin(x)} \end{array}$$

4.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \log x^2 \end{array}$$

5.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \log_3 9^{(x^2)} \end{array}$$

6.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \mid x \mid \end{array}$$

7.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \mid x^2 \mid \end{array}$$

8.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sqrt{\mid x \mid} \end{array}$$

9.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sin(\frac{1}{x}) \end{array}$$

10.

$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \tan^2(x) + 1 \end{array}$$

Exercise 3. *Determine, if possibile, two periods and THE period of the functions*

1.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sin(x)+\cos(x) \end{array}$$

2.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sin(x)\cos(x) \end{array}$$

3.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \tan(2x) \end{array}$$

4.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & x+\sin(x) \end{array}$$

5.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & 1 \end{array}$$

6.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sin(x)+\tan(x) \end{array}$$

7.
$$\begin{array}{rccc} F: & \mathbb{R} & \longrightarrow & \mathbb{R} \\ & x & \mapsto & \sin^2(x)+\cos^2(x) \end{array}$$