SELF-PREPARATION TABLES FOR THE COURSE MATHEMATICAL ANALYSIS 1

Table 1

Functions: general definitions.

Domain of a function		Range of a function	
Function is even if		Function is odd if	
Graph of even function is symmetric w.r.t.		Graph of odd function is symmetric w.r.t.	
Graph $y = f(x) + c$ is obtained from graph $y = f(x)$ by		Graph $y = f(x + c)$ is obtained from graph $y = f(x)$ by	
Inverse function f^{-1} is defined as		Graph $y = f^{-1}(x)$ is obtained from graph $y = f(x)$ by	
Function is injective if		Function is surjective if	
Function is bijective if		Function is monotone if	

After filling the table, give examples

Table 2

Elementary functions

Function	Domain and range	Parity	Relations/properties
$f(x) = x^n$ $n \in \mathbf{N}$ is odd	$D_f = \mathbf{R}, R_f = \mathbf{R}$	odd	$(xy)^n = x^n y^n$
$f(x) = x^n$ $n \in \mathbf{N}$ is even			
$f(x) = x^{-n}$ $n \in \mathbf{N}$ is odd			
$f(x) = x^{-n}$ $n \in \mathbf{N}$ is even			
$f(x) = x^a$ $a \in \mathbf{R}$			
$f(x) = \sin x$			$\sin x = \frac{2\,\mathrm{tg}(x/2)}{1+\mathrm{tg}^2(x/2)}$
$f(x) = \cos x$			
$f(x) = \mathrm{tg}\, x$			
$f(x) = a^x$ $a \in (0, \infty)$			
$f(x) = \log_a x$ $a \in$ ☐			
$f(x) = \arcsin x$			
$f(x) = \arccos x$			
$f(x) = \mathrm{arctg}\, x$			

Table 3

Limits of sequences

Definition: $a_n \to a \in \mathbf{R}$, $n \to \infty$	For each $\varepsilon > 0$ there exists N such that $\|a_n - a\| < \varepsilon, n \geqslant N$
Definition: $a_n \to +\infty$, $n \to \infty$	
Definition: $a_n \to -\infty$, $n \to \infty$	
The Boltzano-Weierstrass theorem:	if $\{a_n\}$ is ☐ and ☐ then $\{a_n\}$ converges
Theorem about three sequences:	
Theorem about two sequences:	
Theorem about arithmetic operations under the limit:	
$\lim_{n\to\infty}\left(1+\frac{c}{n}\right)^n =$	
$a \in \mathbf{R}, b > 1, \quad \lim_{n\to\infty}\frac{n^a}{b^n} =$	
$a > 1, b > 0, \quad \lim_{n\to\infty}\frac{\log_a n}{n^b} =$	
$a < b, \quad \lim_{n\to\infty}\frac{a^n}{b^n} =$	
$a < b, \quad \lim_{n\to\infty}\frac{n^a}{n^b} =$	

Table 4

Limits of functions. Continuity

Definition: $f(x) \to a \in \mathbf{R}$, $x \to x_0$	
Definition: $f(x) \to \pm\infty$, $x \to x_0$	
Definition: $f(x) \to a \in \mathbf{R}$, $x \to x_0\pm$	
Definition: $f(x) \to \pm\infty$, $x \to x_0\pm$	
Definition: f is continuous at x_0 if	
Properties of continuous functions: 1. 2. 3.	
Theorems about three/two functions:	
Theorem about arithmetic operations on functions under the limit:	
$a < b, \quad \lim_{x\to\infty} \frac{x^a}{x^b} =$	
$a < b, \quad \lim_{x\to 0} \frac{x^a}{x^b} =$	
$\lim_{x\to\infty} \left(1 + \frac{c}{x}\right)^x =$	
$\lim_{x\to 0} \frac{\sin x}{x} =$	
$a > 0,\ \lim_{x\to 0} \frac{a^x - 1}{x} =$	
$a > 0, a \neq 1,\ \lim_{x\to 0} \frac{\log_a x}{x} =$	
$p \in \mathbf{R},\ \lim_{x\to 0} \frac{(1+x)^p - 1}{x} =$	

Table 4

Derivatives

Definition: $f'(x) =$	
$(fg)'(x) =$ Give two examples	
$(\frac{f}{g})'(x) =$ Give two examples	
$[f(g)]'(x) =$ Give two examples	
$[f^{-1}]'(x) =$ Give two examples	
Lagrange's theorem:	
Taylor's formula:	
L'Hospital rule:	
$(x^a)' =$	
$(a^x)' =$	
$(\sin x)' =$	
$(\cos x)' =$	
$(\operatorname{tg} x)' =$	
$(\operatorname{ctg} x)' =$	
$(\log_a x)' =$	
$(\mathrm{arctg} x)' =$	
$(\mathrm{arcctg} x)' =$	

After filling the table, calculate:

$(\text{arcsin} x)' =$	
$(\text{arccos} x)' =$	