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1 Introduction

Today I explained the function notation $s(t)$, see the solution of the quiz 1.

2 Problem 1

That is the problem 11 in the section 2.2 in the book.

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

Estimate the limit:

$$\lim_{x\to 1} g(x)$$

We calculate the table:

x	0.2	0.4	0.6	0.8	0.9	0.99	1.8	1.6	1.4	1.2	1.1	1.01
g(x)	0.80	0.64	0.51	0.41	0.37	0.3367	0.16	0.19	0.22	0.27	0.30	0.3300

And we can see, that for $x \to 1$, the $g(x)$ is approaching to something like 0.33, e.g. our guess would be that the limit is equal to $\frac{1}{3}$. We can also calculate that exactly:

$$\lim_{x\to 1} g(x) = \lim_{x\to 1} \frac{x-1}{(x-1)(x^2+x+1)} = \lim_{x\to 1} \frac{1}{x^2+x+1} = \frac{1}{3}$$

3 Problem 2

We did a problem 9, section 2.2. See the solution of the quiz 2 for a solution (just the numbers are different.

4 Limits

We then calculated several limits:

$$\lim_{x\to 2} \frac{x^2+x-6}{x-2} = \lim_{x\to 2} \frac{(x+3)(x-2)}{x-2} = \lim_{x\to 2} x+3 = 5$$

$$\lim_{x\to -4} \frac{x^2+5x+4}{x^2+3x-4} = \lim_{x\to -4} \frac{(x+4)(x+1)}{(x+4)(x-1)} = \lim_{x\to -4} \frac{x+1}{x-1} = \frac{3}{5}$$

$$\lim_{x\to 2} \frac{x^2-x-6}{x-2} = \pm\infty \text{, e.g. the limit doesn't exists}$$

$$\lim_{x\to 1} \frac{x^3-1}{x^2-1} = \lim_{x\to 1} \frac{(x-1)(x^2+x+1)}{(x-1)(x+1)} = \frac{3}{2}$$

$$\lim_{h\to 0} \frac{(2+h)^3-8}{h} = \lim_{h\to 0} \frac{2^3+3\cdot 2^2 h+3\cdot 2h^2+h^3-8}{h} = \lim_{h\to 0} \frac{12h+6h^2+h^3}{h} =$$

$$= \lim_{h\to 0} (12+6h+h^2) = 12$$

5 Quizzes

We did Quiz 2 and 3.