$$\lim_{x \to 1} \frac{x^3 + 6x^2 + 9x + 4}{x^4 - 1} = \frac{1 + 6 + 9 + 4}{1 - 1} = \frac{20}{4}$$

NEMOŽEM POUŽIŤ

SKUPINA C

2.1.

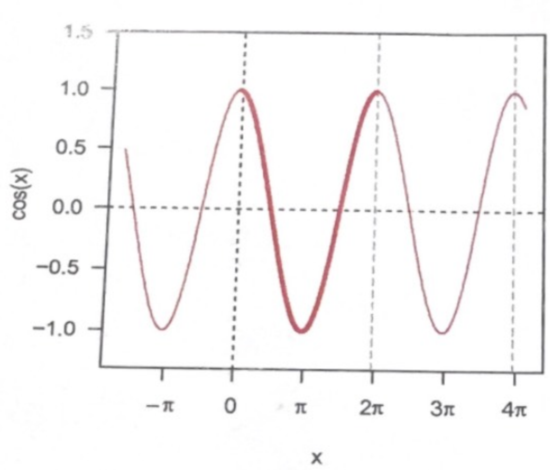
$f(x) = \cos(x)$

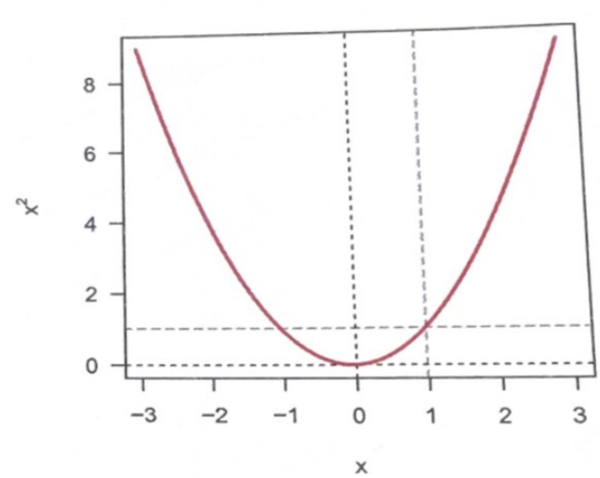
1. $D(f) = (-\infty; \infty)$
2. $H(f) = \langle -1; 1 \rangle$
3. SPOJITÁ
4. OHRANIČENOSŤ ZHORA AJ ZDOLA $(y = -1; 1)$
5. PERIODICKÁ – PERIODA 2π
6. LICHÁ (SYMETRICKÁ PODĽA ~~↑~~→)
7. KLESAJÍCÍ: $(0; \pi) + (2\pi; 3\pi)$ ROSTOUCÍ: $(-\pi; 0) + (\pi; 2\pi) + (3\pi; 4\pi)$
8.

2.2

$f(x) = x^2$

1. $D(f) = (-\infty; \infty)$
2. $H(f) = \langle 0; \infty)$
3. SPOJITÁ
4. OHRANIČENÁ ZDOLA $(y = 0)$
5. NEMÁ PERIODU → NEPERIODICKÁ
6. JE SUDÁ (SYMETRICKÁ PODĽA OSI Y (↑→)
7. KLESAJÍCÍ $(-\infty; 0)$; ROSTOUCÍ $(0; \infty)$
8.





2.3.

1. $x^2 + x - 6$ ⟨ ± 1; ± 2; ± 6; ± 3

	1	1	−6	
−1	1	0	−6	X
1	1	2	−4	X
2	1	3	0	✓

$(x-2)(x+3)$

2. $x^3 + 7x^2 + 11x + 5$

$(x+1)(x+1)(x+5)$

	1	7	11	5	
+1	1	8	19	24	X
−1	1	6	5	0	✓
−1	1	5	0		

2.4.

1. $\lim_{x\to 5} \frac{x^2-5x+4}{x-1} = \frac{5^2-5\cdot 5+4}{5-1} = \frac{25-25+4}{4} = \frac{4}{4} = 1$

2. $\lim_{x\to 2} \frac{3^x+3}{2^x-4^x} = \frac{3^2+3}{2^2-4^2} = \frac{9+3}{4-16} = \frac{12}{-12} = -1$

3. $\lim_{x\to 3} \frac{x^3-x^2-5x-3}{x^2-9} = \frac{27-9-15-3}{9-9} = \frac{0}{0}$ X

$$\lim_{x\to 3} \frac{(x+1)(x+1)(x-3)}{(x+3)(x-3)} = \frac{(3+1)(3+1)}{(3+3)} = \frac{16}{6} = \frac{8}{3}$$

4. $\lim_{x\to 3} 3x^2-7 = 3\cdot 3^2-7 = 3\cdot 9-7 = 20$

2.5

1. $\lim_{x\to -\infty} \frac{2x-x}{x} = \frac{2\cdot(-\infty)-(-\infty)}{-\infty} = -2$

2. $\lim_{x\to -\infty} \frac{4x+2-3x^2-2x^7}{2x^3+x^5-3} = \frac{-2x^7-3x^2+4x+2}{x^5+2x^3-3} =$

$$\frac{-\frac{2x^7}{x^7}-\frac{3x^2}{x^7}+\frac{4x}{x^7}+\frac{2}{x^7}}{\frac{x^5}{x^7}+\frac{2x^3}{x^7}-\frac{3}{x^7}} = \frac{-2-0+0+0}{0+0-0} = +\infty$$

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

$$\frac{0+0+0}{3-0-0+0} = \frac{0}{3} = 0$$

4. $\lim_{x\to -\infty} \left(\frac{7^x}{5^x}\right)-\left(\frac{5}{5}\right)^x = \lim_{\infty}\left(\frac{5}{7}\right)^x-\left(1^x\right) = 0-1 = -1$

5. $\lim_{x\to} \frac{2+\frac{1}{4^x}}{2-\frac{1}{5^x}} = \frac{2+0}{2-0} = \frac{2}{2} = 1$

6. $\lim_{x\to-\infty} \frac{6^x-2^x}{3^x} = \frac{6^x}{3^x} - \frac{2^x}{3^x} = \lim_{x\to\infty} \left(\frac{3}{6}\right)^x - \left(\frac{3}{2}\right)^x = 0-\infty = -\infty$

7. $\lim_{x\to\infty} \frac{1+2x-x^3+4x^5}{x^4+2x^5-x^3} = \frac{\frac{4x^5}{x^5} + \frac{2x^3}{x^5} + \frac{2x}{x^5} + \frac{1}{x^5}}{\frac{x^4}{x^5} + \frac{2x^5}{x^5} - \frac{x^3}{x^5}} = \frac{4-0+0+0}{0+2-0} = \frac{4}{2} = \frac{2}{1} = 2$

8. $\lim_{x\to\infty} \frac{4^x-3^x}{5^x} = \left(\frac{4}{5}\right)^x - \left(\frac{3}{5}\right)^x = 0$

2.6 1. $(x^4+x^{-4}+x^0-\tan(x)+e^x)' = 4x^3-4x^{-5}+0x^{-1}-\frac{1}{\cos^2 x}+e^x$
$= 4x^3-4x^5-\frac{1}{\cos^2 x}+e^x$

2. ??? ∴

3. $((x+x^4)\ln(x)-4x\sin(x))' = ((1+4x^3)\cdot\ln(x)+(x+x^4)\cdot\frac{1}{x})$
$-((4\cdot\sin(x))+(4x\cdot\cos))$ $= (1+4x^3)\ln(x)+x^3+1-4\sin x-4\cos x$

4. ??? ∴

5. $(3\ln(x)\cdot\operatorname{tg}(x)+\sin(x)\cdot\cos(x))' = (3\cdot\frac{1}{x}\cdot\operatorname{tg}x)+(3\ln x\cdot\frac{1}{\cos^2 x})$
$+(\cos x\cdot\cos x)+(\sin x)\cdot(-\sin x) = (\frac{3}{x}\operatorname{tg}x)+\frac{3\ln x}{\cos^2 x}+\cos^2 x-\sin^2 x$
$= \frac{3\operatorname{tg}x}{x}+\frac{3\ln x}{\cos^2 x}+\cos^2 x-\sin^2 x$

6. $(2x^6-x^4+3x^3+5x)' = 2\cdot 6x^5-4x^3+3\cdot 3x^2+5 = 12x^5-4x^3+9x^2+5$

7. ??? ∴

??? 8. $\left(\frac{-2}{\sin(2x+3)}\right)' = \frac{(0\cdot\sin(2x+3)-(-2\cdot\cos(2x+3))}{\sin^2(2x+3)} = \frac{2\cdot\cos(2x+3)}{\sin^2(2x+3)}$

2.7 1. $(x^{-1}\ln(x))'' = -1\cdot x^{-2}\cdot\ln(x)+x^{-1}\cdot\frac{1}{x}$
$(-x^{-2}\cdot\ln x+\frac{1}{x^2})' = 2x^{-3}\cdot\ln x-x^{-2}\cdot\frac{1}{x}+3\cdot\frac{1}{x^3}\ /x^3$
$= 2x^{-3}\cdot\ln x-\frac{1}{x^2}\cdot\frac{1}{x}+3\frac{1}{x^4} = \frac{2x^{-3}\cdot\ln(x)-3}{x^3}$

2. ??? ∴

3. $(\sin(x)\ln(x))'' = (\cos x \cdot \ln(x) \cdot \sin x \cdot \frac{1}{x})' = -\sin x \cdot \ln x + \cos x \cdot \frac{1}{x} \cdot \cos x \cdot \frac{1}{x} + \sin x \cdot (-\frac{1}{x^2}) = \frac{2\cos x}{x} - \sin x \cdot \ln x + \frac{1}{x^2}$

4. $(2x^6 - x^4 + 3x^3 + 4x^2 - 5)'' = (12x^5 - 4x^3 + 9x^2 + 8x)' = 60x^4 - 12x^2 + 18x + 8 = 2 \cdot (30x^4 - 6x^2 + 9x + 4)$

2.8 1. $\lim_{x \to 3} \frac{x^3 - x^2 + 5x - 3}{x^2 - 9} = \frac{3^3 - 3^2 + 5 \cdot 3 - 3}{3^2 - 9} = \frac{27 - 5 + 15 - 3}{27 - 9} = 15 - 3 = 12$

$\lim_{x \to 3^-} = -\infty \quad \lim_{x \to 3^+} = +\infty \Rightarrow \lim_{x \to 3}$ NEEXISTĂ

2. $\lim_{x \to 3} \frac{x^3 - x^2 - 5x - 3}{x^2 - 9} = \frac{3^3 - 3^2 - 5 \cdot 3 - 3}{3^2 - 9} = \frac{27 - 9 - 15 - 3}{9 - 9} = \frac{0}{0}$

$\frac{(x^3 - x^2 - 5x - 3)'}{(x^2 - 9)'} = \frac{3x^2 - 2x - 5}{2x} = \frac{3 \cdot 3^2 - 2 \cdot 3 - 5}{2 \cdot 3}$

$= \frac{3 \cdot 9 - 6 - 5}{6} = \frac{16}{6} = \frac{8}{3}$

3. $\lim_{x \to -1} \frac{(3x^3 - 7x^2 - 2x + 8)'}{(4x^2 + x - 3)'} = \frac{9x^2 - 14x - 2}{8x + 1} = \frac{9 \cdot (-1)^2 - 14 \cdot (-1) - 2)}{8 \cdot (-1) + 1}$

$= \frac{9 + 14 - 2}{-7} = -\frac{21}{7} = -3$