Matematika I skupina A1 ....

1) Urcete definicni obor funkce:

$$f(x)=\sqrt{x^2-x-2}+\ln\frac{x-3}{-2-x}$$

2) Vypocítejte limitu

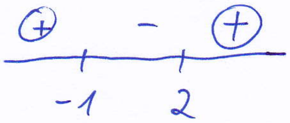
$$\lim_{x\to\infty} x^2e^{-x}$$

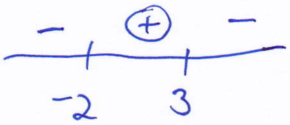
3) Urcete intervaly, na kterých je funkce $f(x)=4x^3-3x^4$ rostoucí ci klesající, najdete lokální extrémy.

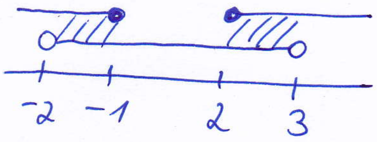
4) Najděte všechny asymptoty funkce $f(x)=\dfrac{2x^2-x}{3-x}$.

① $x^2-x-2\ge 0$ $\qquad \dfrac{x-3}{-2-x}>0$

$(x-2)(x+1)\ge 0$







$D_f=(-2;-1\rangle\cup\langle 2,3)$

② $\lim\limits_{x\to\infty} x^2\cdot e^{-x}=[\infty\cdot 0]=\lim\limits_{x\to\infty}\dfrac{x^2}{e^x}\overset{LH}{=}\lim\limits_{x\to\infty}\dfrac{2x}{e^x}\overset{LH}{=}\lim\limits_{x\to\infty}\dfrac{2}{e^x}=\left[\dfrac{2}{\infty}\right]=\underline{\underline{0}}$

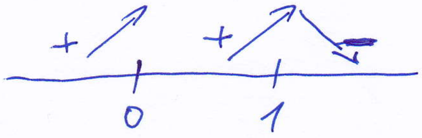
③ $f'=12x^2-12x^3$ $\qquad D_f=R$

$12x^2-12x^3=0$

$12x^2(1-x)=0$

$\downarrow \qquad \downarrow$

$x=0 \qquad x=1$



rost. $(-\infty;0\rangle,\ \langle 0,1\rangle$

kles. $\langle 1,+\infty)$

lok. max. $[1;1]$

lok. min. není

④ $D_f=R\setminus\{3\}$

$\lim\limits_{x\to 3+}\dfrac{2x^2-x}{3-x}=\left[\dfrac{15}{0-}\right]=-\infty \Rightarrow$ as. bez směrnice $\underline{\underline{x=3}}$

$k=\lim\limits_{x\to\pm\infty}\dfrac{\frac{2x^2-x}{3-x}}{x}=\lim\limits_{x\to\pm\infty}\dfrac{2x^2-x}{3x-x^2}=-2$

$q=\lim\limits_{x\to\pm\infty}\dfrac{2x^2-x}{3-x}+2x=\lim\limits_{x\to\pm\infty}\dfrac{2x^2-x+6x-2x^2}{3-x}=\lim\limits_{x\to\pm\infty}\dfrac{5x}{3-x}=-5$

as. se směrn. v $\pm\infty$ $\quad\underline{\underline{y=-2x-5}}$

Matematika I skupina A2 ....

1) Urcete definicní obor funkce:

$$f(x)=\sqrt{\frac{x+1}{5+x}}+\ln\left(-x^2-x+12\right)$$

2) Vypocítejte limitu

$$\lim_{x\to 0}\frac{2arctg3x}{5x}$$

3) Urcete intervaly, na kterých je funkce $f(x)=x\ln x$ konvexní ci konkávní, najdete inflexní body.

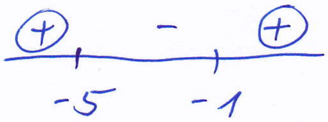
4) Urcete rovnici tecny a normály ke grafu funkce $f(x)=\frac{3x-4}{2x-3}$ v bode T = [2; ?].

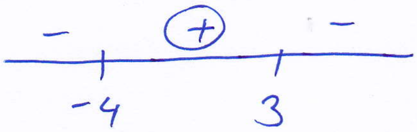
① $\frac{x+1}{5+x}\geq 0 \quad x\neq -5$

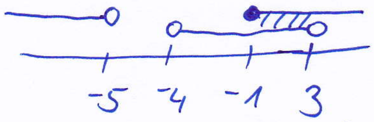
$-x^2-x+12>0$

$-(x^2+x-12)>0$

$-(x+4)(x-3)>0$







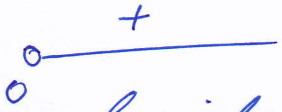
$\underline{\underline{Df = \langle -1; 3)}}$

② $\lim\limits_{x\to 0}\frac{2arctg\,3x}{5x} = \left[\frac{0}{0}\right] \overset{LH}{=} \lim\limits_{x\to 0}\frac{2\cdot\frac{1}{1+(3x)^2}\cdot 3}{5} = \frac{2\cdot 1\cdot 3}{5} = \underline{\underline{\frac{6}{5}}}$

③ $f' = \ln x + x\cdot\frac{1}{x} = \ln x + 1$

$f'' = \frac{1}{x}$

$Df = (0; \infty)$



$\frac{1}{x}=0$

fce je konvexní $(0,+\infty)$
(na celém Df)

$1\neq 0$ není infl. bod

④ $x_0 = 2 \qquad y_0 = \frac{3\cdot 2-4}{2\cdot 2-3} = 2$

$f' = \frac{3(2x-3)-(3x-4)\cdot 2}{(2x-3)^2} = \frac{6x-9-6x+8}{(2x-3)^2} = \frac{-1}{(2x-3)^2}$

$f'(2) = \frac{-1}{(2\cdot 2-3)^2} = -1$

t: $y = -1(x-2)+2$

$\underline{\underline{y = -x+4}}$

n: $y = \frac{-1}{-1}(x-2)+2$

$\underline{\underline{y = x}}$

Matematika I skupina B1 ....

1) Urcete definicní obor funkce:

$$f(x)=\frac{\ln\left(x^2+x-6\right)}{\sqrt{4x-x^2}}$$

2) Vypocítejte limitu

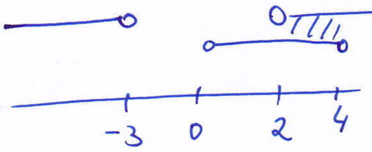
$$\lim_{x\to\infty}\frac{\log x}{1-x}$$

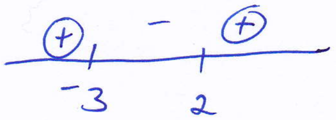
3) Urcete intervaly, na kterých je funkce $f(x)=e^{-\frac{1}{2}x^2}$ konvexní ci konkávní, najdete inflexní body.

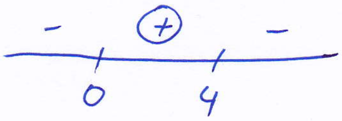
4) Najdete inverzní funkci k funkci $f(x)=3^{x-4}+2$. Urcete definicní obor a obor hodnot obou dvou funkcí.

① $x^2+x-6>0$ $\qquad 4x-x^2>0$

$(x+3)(x-2)>0$ $\qquad x(4-x)>0$







$D_f=(2,4)$

② $\lim\limits_{x\to\infty}\frac{\log x}{1-x}=\left[\frac{\infty}{-\infty}\right]\overset{LH}{=}\lim\limits_{x\to\infty}\frac{\frac{1}{x\cdot\ln 10}}{-1}=\left[-\frac{1}{\infty}\right]=0$

③ $f'=e^{-\frac{1}{2}x^2}\cdot\left(-\frac{1}{2}\cdot 2x\right)=e^{-\frac{1}{2}x^2}\cdot(-x)$

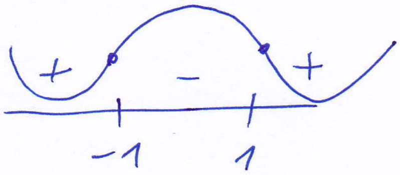
$f''=e^{-\frac{1}{2}x^2}\cdot(-x)^2+e^{-\frac{1}{2}x^2}\cdot(-1)=e^{-\frac{1}{2}x^2}\left(x^2-1\right)$

$e^{-\frac{1}{2}x^2}\left(x^2-1\right)=0$

$x^2-1=0$

$x=\pm 1$

$D_f=R$



konvexní $(-\infty;-1\rangle$, $\langle 1;+\infty)$

konkávní $\langle -1;1\rangle$

infl. body $\left[-1;e^{-\frac{1}{2}}\right]$ $\left[1;e^{-\frac{1}{2}}\right]$

④ $f^{-1}:\ x=3^{y-4}+2$ $\qquad D_f=R=H_{f^{-1}}$

$x-2=3^{y-4}$

$\log_3(x-2)=y-4$

$\log_3(x-2)+4=y$

$\to x-2>0$ $\qquad D_{f^{-1}}=(2;+\infty)=H_f$

$x>2$

Matematika I skupina B2 ....

1) Určete definiční obor funkce:

$$f(x) = \ln\frac{2x+6}{4-x} - \sqrt{x^2-6x+5}$$

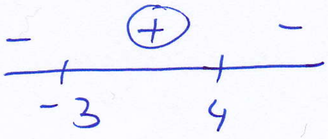
2) Vypočítejte limitu

$$\lim_{x\to\infty}\frac{e^{4x}}{3x^2}$$

3) Určete intervaly, na kterých je funkce $f(x) = x + \frac{4}{x}$ rostoucí či klesající, najděte lokální extrémy.

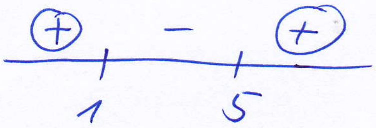
4) Určete rovnici tečny ke grafu funkce $f(x) = \ln(2x+1)$ v bodě T[0;?] a pomocí diferenciálu vypočítejte přibližnou hodnotu funkce f(0,01).

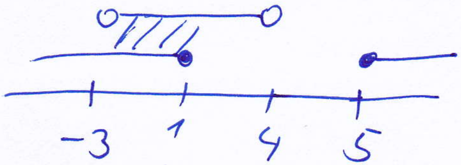
① $\frac{2x+6}{4-x} > 0$



$x^2-6x+5 \geq 0$

$(x-5)(x-1) \geq 0$





$\underline{\underline{Df = (-3; 1\rangle}}$

② $\lim\limits_{x\to\infty}\frac{e^{4x}}{3x^2} = \left[\frac{\infty}{\infty}\right] \overset{LH}{=} \lim\limits_{x\to\infty}\frac{e^{4x}\cdot 4}{6x} = \left[\frac{\infty}{\infty}\right] \overset{LH}{=} \lim\limits_{x\to\infty}\frac{e^{4x}\cdot 16}{6} = \underline{\underline{\infty}}$

③ $f' = 1 + 4\cdot(-x^{-2}) = 1 - \frac{4}{x^2}$

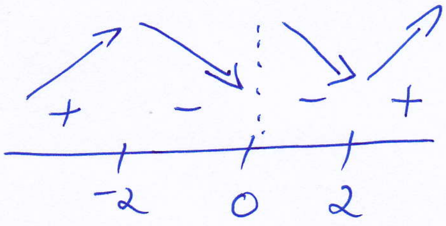
$1 - \frac{4}{x^2} = 0$

$x^2 - 4 = 0$

$x^2 = 4$

$x = \pm 2$

$Df = R \setminus \{0\}$



rost. $(-\infty; -2\rangle, \langle 2; +\infty)$

kles. $\langle -2; 0), (0; 2\rangle$

lok. max. $[-2; -4]$

lok. min $[2; 4]$

④ $x_0 = 0$ $y_0 = \ln(2\cdot 0+1) = 0$

$f' = \frac{1}{2x+1}\cdot 2 = \frac{2}{2x+1}$ $f'(0) = \frac{2}{2\cdot 0+1} = 2$

t: $y = 2(x-0)+0$

$\underline{\underline{y = 2x}}$

~~n: $y = -\frac{1}{2}(x-0)+0$~~

~~$y = -\frac{1}{2}x$~~

$f(0{,}01) = 2\cdot 0{,}01 = \underline{\underline{0{,}02}}$

Matematika I skupina C1 ....

1) Urcete definicní obor funkce:

$$f(x)=\frac{\ln\left(x^2+6x+8\right)}{x-3}-\sqrt{2x-1}$$

2) Vypocítejte limitu

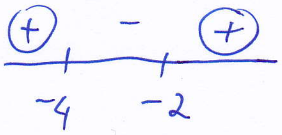
$$\lim_{x\to 0}\frac{\arcsin x}{1-e^x}$$

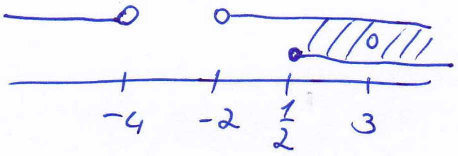
3) Urcete intervaly, na kterých je funkce $f(x)=x^2e^{-x}$ rostoucí ci klesající, najdete lokální extrémy.

4) Najdete rovnici inverzní funkce k funkci $f(x)=\log_2(x+3)-4$. Urcete definicní obor a obor hodnot obou funkcí.

① $x^2+6x+8>0$ $x-3\neq 0$ $2x-1\geq 0$

$(x+4)(x+2)>0$ $x\neq 3$ $x\geq\frac{1}{2}$





$Df=\langle\frac{1}{2};\infty)-\{3\}$

② $\lim\limits_{x\to 0}\frac{\arcsin x}{1-e^x}=\left[\frac{0}{0}\right]\overset{LH}{=}\lim\limits_{x\to 0}\frac{\frac{1}{\sqrt{1-x^2}}}{-e^x}=\frac{1}{-1}=-1$

③ $f'=2x\cdot e^{-x}+x^2\cdot e^{-x}(-1)=e^{-x}(2x-x^2)$

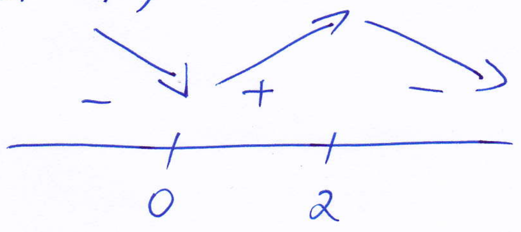
$Df=R$

$e^{-x}(2x-x^2)=0$

$2x-x^2=0$

$x(2-x)=0$

$x=0$ $x=2$



kles. $(-\infty;0\rangle$, $\langle 2;+\infty)$

rost. $\langle 0,2\rangle$

lok. min. $[0;0]$

lok. max. $[2;4e^{-2}]$

④ f^{-1}: $\overset{x}{\cancel{y}}=\log_2(y+3)-4$

$x+4=\log_2(y+3)$ $\rightarrow$ $x+3>0$

$x>-3$ $Df=(-3;+\infty)=Hf^{-1}$

$2^{x+4}=y+3$

$2^{x+4}-3=y$ $\rightarrow$ $Df^{-1}=R=Hf$

Matematika I skupina C2 ....

1) Určete definiční obor funkce:

$$f(x)=\frac{\ln\left(-x^2+x+12\right)}{\sqrt{2x^2-2}}$$

2) Vypočítejte limitu

$$\lim_{x\to 0}\frac{x\cos x}{2\sin x}$$

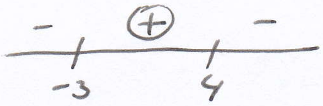
3) Určete intervaly, na kterých je funkce $f(x)=x+\frac{1}{x^2}$ konvexní či konkávní, najděte inflexní body.

4) Určete rovnici tečny a normály ke grafu funkce $f(x)=3x^2-2\sqrt{x}$ v bodě T[1,?].

① $-x^2+x+12>0$

$-(x^2-x-12)>0$

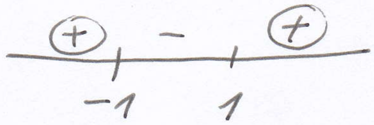
$-(x-4)(x+3)>0$

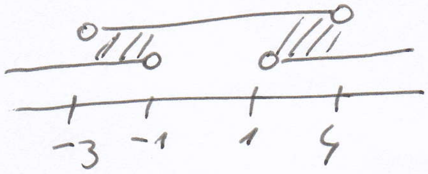


$2x^2-2>0$

$2(x^2-1)>0$

$2(x-1)(x+1)>0$





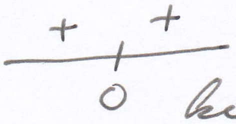
$D_f=(-3,-1)\cup(1,4)$

② $\lim\limits_{x\to 0}\frac{x\cos x}{2\sin x}=\left[\frac{0}{0}\right]\overset{LH}{=}\lim\limits_{x\to 0}\frac{\cos x+x(-\sin x)}{2\cos x}=\frac{1+0}{2}=\underline{\underline{\frac{1}{2}}}$

③ $f'(x)=1+(-2x^{-3})=1-2x^{-3}$

$f''=-2\cdot(-3x^{-4})=6x^{-4}=\frac{6}{x^4}$ $\qquad \frac{6}{x^4}=0$

$D_f=R\setminus\{0\}$



$6\neq 0$ není infl. bod

konvexní $(-\infty,0),(0,\infty)$

④ $x_0=1$ $\quad y_0=3\cdot 1-2\sqrt{1}=1$

$f'=6x-2\cdot\frac{1}{2}x^{-\frac{1}{2}}=6x-\frac{1}{\sqrt{x}}$ $\qquad f'(1)=6-\frac{1}{1}=5$

t: $y=5(x-1)+1$

$\underline{\underline{y=5x-4}}$

n: $y=-\frac{1}{5}(x-1)+1$

$\underline{\underline{y=-\frac{1}{5}x+\frac{6}{5}}}$

Matematika I skupina D1 ....

1) Určete definiční obor funkce:

$$f(x)=\ln\frac{x-2}{3+x}-\sqrt{x^2-4x+3}$$

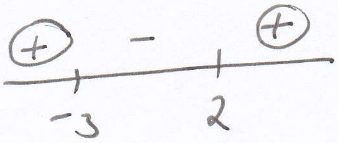
2) Vypočítejte limitu

$$\lim_{x\to 0}\frac{arctg2x}{2\arcsin x}$$

3) Určete intervaly, na kterých je funkce $f(x)=\frac{e^x}{1+x}$ rostoucí či klesající a najděte lokální extrémy.

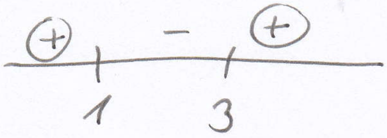
4) Najděte rovnice všech asymptot funkce $f(x)=\frac{3x^2-1}{x+1}$.

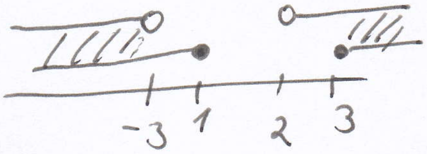
① $\frac{x-2}{3+x}>0$



$x^2-4x+3\ge 0$

$(x-3)(x-1)\ge 0$





$Df=(-\infty,-3)\cup\langle 3,\infty)$

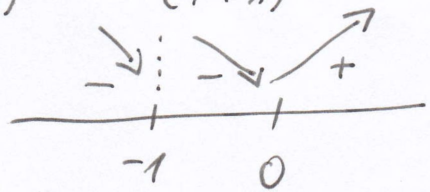
② $$\lim_{x\to 0}\frac{arctg2x}{2arcsin x}=\left[\frac{0}{0}\right]=\lim_{x\to 0}\frac{\frac{1}{1+4x^2}\cdot 2}{2\cdot\frac{1}{\sqrt{1-x^2}}}=\frac{\frac{1}{1+0}\cdot 2}{2\cdot\frac{1}{1}}=\underline{\underline{1}}$$

③ $$f'=\frac{e^x\cdot(1+x)-e^x\cdot 1}{(1+x)^2}=\frac{e^x(1+x-1)}{(1+x)^2}=\frac{x\cdot e^x}{(1+x)^2}$$

$x\cdot e^x=0$

$x=0$

$Df=R\setminus\{-1\}$



kles. $(-\infty,-1),(-1,0\rangle$

rost. $\langle 0,\infty)$

lok. min. $[0;1]$

④ $Df=R\setminus\{-1\}$ $\lim_{x\to -1+}\frac{3x^2-1}{x+1}=\left[\frac{2}{0+}\right]=+\infty\Rightarrow$ as. bez směrnice $x=-1$

$$k=\lim_{x\to\pm\infty}\frac{\frac{3x^2-1}{1+x}}{x}=\lim_{x\to\pm\infty}\frac{3x^2-1}{x+x^2}=3$$

$$q=\lim_{x\to\pm\infty}\frac{3x^2-1}{x+1}-3x=\lim_{x\to\pm\infty}\frac{3x^2-1-3x^2-3x}{x+1}=\lim_{x\to\pm\infty}\frac{-3x-1}{x+1}=-3$$

as. se směrnicí v $\pm\infty$ $y=3x-3$

Matematika I skupina D2 ....

1) Určete definiční obor funkce:

$$f(x)=\sqrt{\frac{2x+3}{x}}+\ln\left(-x^2+2x+8\right)$$

2) Vypočítejte limitu

$$\lim_{x\to 0}\frac{\sqrt{1+x}-1}{x}$$

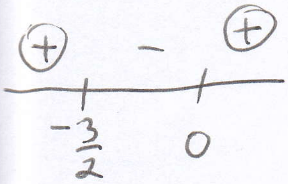
3) Určete intervaly, na kterých je funkce $f(x)=x^2+\frac{1}{x}$ konvexní či konkávní, najděte inflexní body.

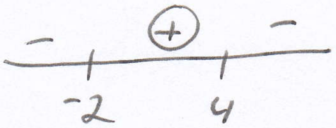
4) Najděte rovnici tečny a normály ke grafu funkce $f(x)=e^{-x^2+1}$ v bodě T[1;?].

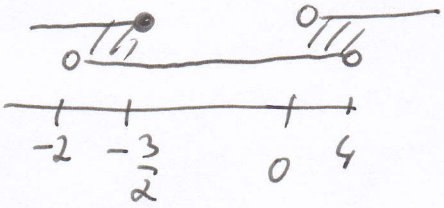
① $\frac{2x+3}{x}\geq 0$ $x\neq 0$ $-x^2+2x+8>0$

$-(x^2-2x-8)>0$

$-(x-4)(x+2)>0$







$Df=(-2;-\frac{3}{2}>\cup(0,4)$

② $\lim_{x\to 0}\frac{\sqrt{1+x}-1}{x}=\left[\frac{0}{0}\right]\overset{LH}{=}\lim_{x\to 0}\frac{\frac{1}{2}(1+x)^{-\frac{1}{2}}}{1}=\lim_{x\to 0}\frac{1}{2\sqrt{1+x}}=\underline{\underline{\frac{1}{2}}}$

③ $f'=2x+(-x^{-2})$

$f''=2+2x^{-3}=2+\frac{2}{x^3}$

$2+\frac{2}{x^3}=0$

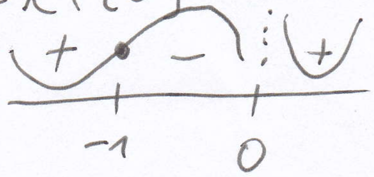
$2x^3+2=0$

$2x^3=-2$

$x^3=-1$

$x=-1$

$Df=R\setminus\{0\}$



konvexní $(-\infty;-1>$, $(0,\infty)$

konkávní $<-1,0)$

infl. bod $[-1;0]$

④ $x_0=1$ $y_0=e^{-1+1}=1$

$f'=e^{-x^2+1}\cdot(-2x)$

$f'(1)=e^{-1+1}\cdot(-2)=-2$

t: $y=-2(x-1)+1$

$\underline{y=-2x+3}$

n: $y=-\frac{1}{-2}(x-1)+1$

$\underline{\underline{y=\frac{1}{2}x+\frac{1}{2}}}$

Matematika I skupina E1 ....

1) Urcete definicní obor funkce:

$$f(x)=\frac{\ln\left(x^2+2x\right)}{\sqrt{x^2-5x-6}}$$

2) Vypocítejte limitu

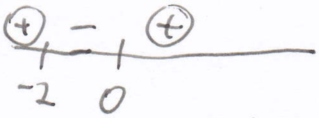
$$\lim_{x\to0}\frac{e^{2x}-x-1}{3x}$$

3) Urcete intervaly, na kterých je funkce $f(x)=3x^5-5x^4+4$ konvexní ci konkávní, najdete inflexní body.

4) Určete rovnice všech asymptot funkce $f(x)=xe^{-x}$.

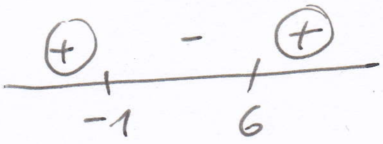
① $x^2+2x>0$

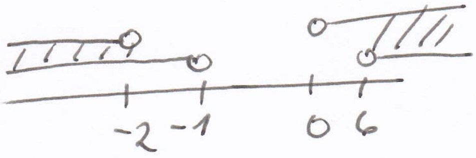
$x(x+2)>0$



$x^2-5x-6>0$

$(x+1)(x-6)>0$





$Df=(-\infty,-2)\cup(6,\infty)$

② $\lim\limits_{x\to0}\frac{e^{2x}-x-1}{3x}=\left[\frac{0}{0}\right]\overset{LH}{=}\lim\limits_{x\to0}\frac{e^{2x}\cdot2-1}{3}=\frac{2-1}{3}=\frac{1}{3}$

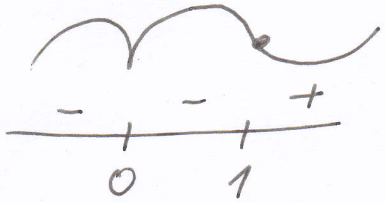
③ $f'=15x^4-20x^3$ $Df=R$

$f''=60x^3-60x^2$

$60x^3-60x^2=0$

$60x^2(x-1)=0$

$x=0\quad x=1$



konkávní $(-\infty;0\rangle,\langle0,1\rangle$

konvexní $\langle1,\infty)$

infl. bod $[1;2]$

④ $Df=R$ → bez směrnice nejsou

$k_1=\lim\limits_{x\to+\infty}\frac{xe^{-x}}{x}=\lim\limits_{x\to+\infty}e^{-x}=0$

$k_2=\lim\limits_{x\to-\infty}\frac{xe^{-x}}{x}=\lim\limits_{x\to-\infty}e^{-x}=+\infty$ v $-\infty$ as. neexistuje

$q=\lim\limits_{x\to+\infty}xe^{-x}-0=\lim\limits_{x\to\infty}\frac{x}{e^x}=\left[\frac{\infty}{\infty}\right]\overset{LH}{=}\lim\limits_{x\to\infty}\frac{1}{e^x}=0$

as. v $+\infty$: $y=0$

Matematika I skupina E2 ....

1) Urcete definicní obor funkce:

$$f(x)=\frac{\ln\left(x^2-x-6\right)}{\sqrt{4x-x^2}}$$

2) Vypocítejte limitu

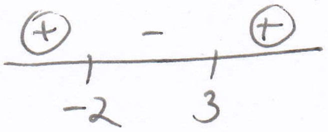
$$\lim_{x\to\infty}\frac{\ln x-2}{x+1}$$

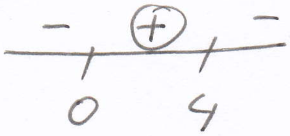
3) Urcete intervaly, na kterých je funkce $f(x)=-2+12x-x^3$ rostoucí ci klesající a najdete lokální extrémy.

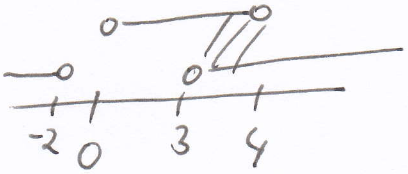
4) Urcete rovnici tecny ke grafu funkce $f(x)=x\ln x$ v bode T[1;?] a pomocí diferenciálu vypocítejte približnou hodnotu f(1,01).

① $x^2-x-6>0$ $4x-x^2>0$

$(x-3)(x+2)>0$ $x(4-x)>0$







$D_f=(3,4)$

② $\lim\limits_{x\to\infty}\dfrac{\ln x-2}{x+1}=\left[\dfrac{\infty}{\infty}\right]\overset{LH}{=}\lim\limits_{x\to\infty}\dfrac{\frac{1}{x}}{1}=\underline{\underline{0}}$

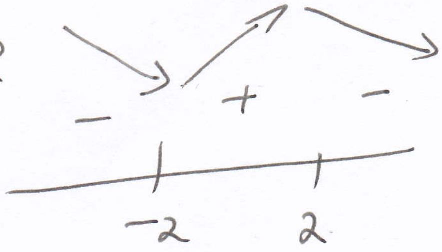
③ $f'=12-3x^2$ $D_f=R$

$12-3x^2=0$

$12=3x^2$

$4=x^2$

$\pm2=x$



rost. $\langle-2,2\rangle$

kles. $(-\infty;-2\rangle,\langle2,\infty)$

lok. max. $[2;14]$

lok. min. $[-2;-18]$

④ $x_0=1$ $y_0=1\cdot\ln1=0$

$f'=\ln x+x\cdot\frac{1}{x}=\ln x+1$

$f'(1)=\ln1+1=1$

t: $y=1\cdot(x-1)+0$

$\underline{\underline{y=x-1}}$

$f(1{,}01)=1{,}01-1=\underline{\underline{0{,}01}}$

Matematika I skupina F1 ....

1) Urcete definicní obor funkce:

$$f(x)=\ln\left(x^2-4x-5\right)+\sqrt{\frac{2x-4}{3x-5}}$$

2) Vypocítejte limitu

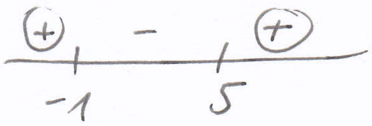
$$\lim_{x\to\infty}\frac{x\ln x}{2x+1}$$

3) Urcete intervaly, na kterých je funkce $f(x)=x^4+2x^3-12x^2$ konvexní ci konkávní, najdete inflexní body.

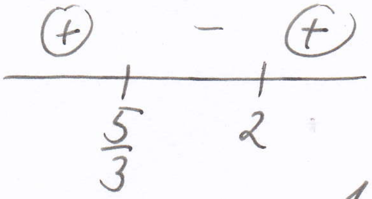
4) Najděte všechny asymptoty funkce $f(x)=\dfrac{x^2+2}{1-x}$.

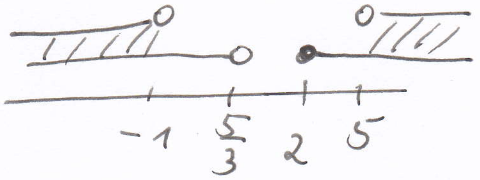
① $x^2-4x-5>0$

$(x-5)(x+1)>0$



$\frac{2x-4}{3x-5}\geq 0$





$Df=(-\infty;-1)\cup(5;+\infty)$

② $\lim\limits_{x\to\infty}\frac{x\ln x}{2x+1}=\left[\frac{\infty}{\infty}\right]\overset{LH}{=}\lim\limits_{x\to\infty}\frac{\ln x+x\frac{1}{x}}{2}=\lim\limits_{x\to\infty}\frac{\ln x+1}{2}=\underline{\underline{\infty}}$

③ $f'=4x^3+6x^2-24x$

$f''=12x^2+12x-24$

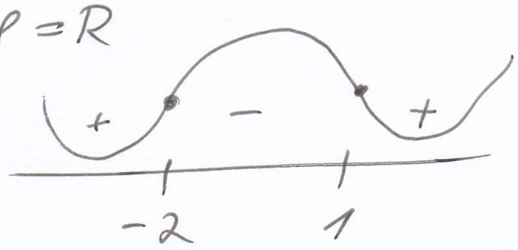
$12x^2+12x-24=0$

$12(x^2+x-2)=0$

$12(x+2)(x-1)=0$

$x=-2 \quad x=1$

$Df=R$



konkávní $\langle -2;1\rangle$

konvexní $(-\infty;-2\rangle, \langle 1,\infty)$

infl. body $[-2;-48]$

$[1;-9]$

④ $Df=R\setminus\{1\}$ $\lim\limits_{x\to 1+}\frac{x^2+2}{1-x}=\left[\frac{3}{0-}\right]=-\infty \Rightarrow$ as. bez směrnice $x=1$

$k=\lim\limits_{x\to\pm\infty}\frac{\frac{x^2+2}{1-x}}{x}=\lim\limits_{x\to\pm\infty}\frac{x^2+2}{x-x^2}=-1$

$q=\lim\limits_{x\to\pm\infty}\frac{x^2+2}{1-x}+x=\lim\limits_{x\to\pm\infty}\frac{x^2+2+x-x^2}{1-x}=\lim\limits_{x\to\pm\infty}\frac{2+x}{1-x}=-1$

as. se směrnicí v $\pm\infty$

$y=-x-1$

Matematika I skupina F2 ....

1) Urcete definicní obor funkce:

$$f(x) = \ln\frac{3-x}{-3-x} + \sqrt{-x^2-3x+4}$$

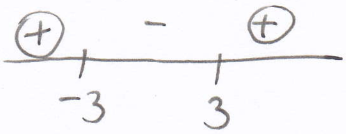
2) Vypocítejte limitu

$$\lim_{x\to 0}\frac{e^x-1}{\sin 2x}$$

3) Urcete intervaly, na kterých je funkce $f(x) = \frac{x}{1+x^2}$ rostoucí ci klesající a najdete lokální extrémy.

4) Napište rovnici tečny a normály ke grafu funkce $f(x) = x^3 + 2x$ v bode T[1;?]

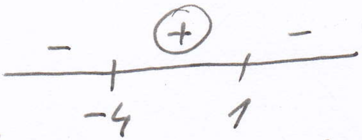
① $\frac{3-x}{-3-x} > 0$

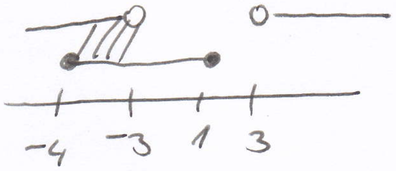


$-x^2-3x+4 \geq 0$

$-(x^2+3x-4) \geq 0$

$-(x-1)(x+4) \geq 0$





$D_f = \langle -4, -3)$

② $\lim\limits_{x\to 0}\frac{e^x-1}{\sin 2x} = \left[\frac{0}{0}\right] \overset{LH}{=} \lim\limits_{x\to 0}\frac{e^x}{\cos 2x\cdot 2} = \frac{1}{1\cdot 2} = \underline{\underline{\frac{1}{2}}}$

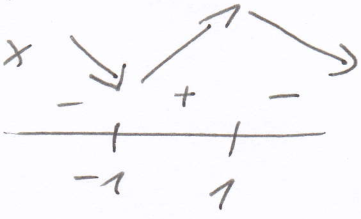
③ $f' = \frac{1\cdot(1+x^2) - x\cdot 2x}{(1+x^2)^2} = \frac{1-x^2}{(1+x^2)^2}$

$1-x^2=0$

$1 = x^2$

$\pm 1 = x$

$D_f = R$



kles. $(-\infty; -1\rangle, \langle 1, \infty)$

rost. $\langle -1, 1\rangle$

lok. min. $[-1; -\frac{1}{2}]$

lok. max. $[1; \frac{1}{2}]$

④ $x_0 = 1$

$y_0 = 1^3 + 2\cdot 1 = 3$

$f' = 3x^2+2$

$f'(1) = 5$

t: $y = 5(x-1)+3$

$y = \underline{\underline{5x-2}}$

n: $y = -\frac{1}{5}(x-1)+3$

$\underline{\underline{y = -\frac{1}{5}x + \frac{16}{5}}}$