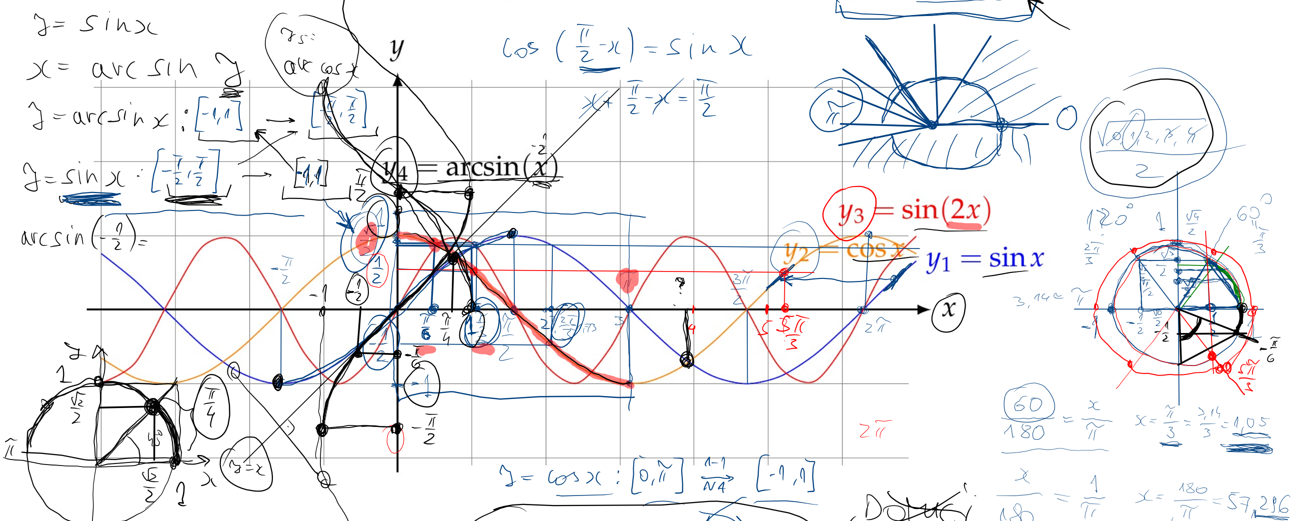
Skicirati grafike funkcija $y_1=\sin x$, $y_2=\cos x$, $y_3=\sin(2x)$, $y_4=\arcsin x$.



Kotirati na grafiku bitne tačke.

$y=\cos x : [0,\pi] \xrightarrow{1-1, NA} [-1,1]$

$y=\arccos x : [-1,1] \to [0,\pi]$

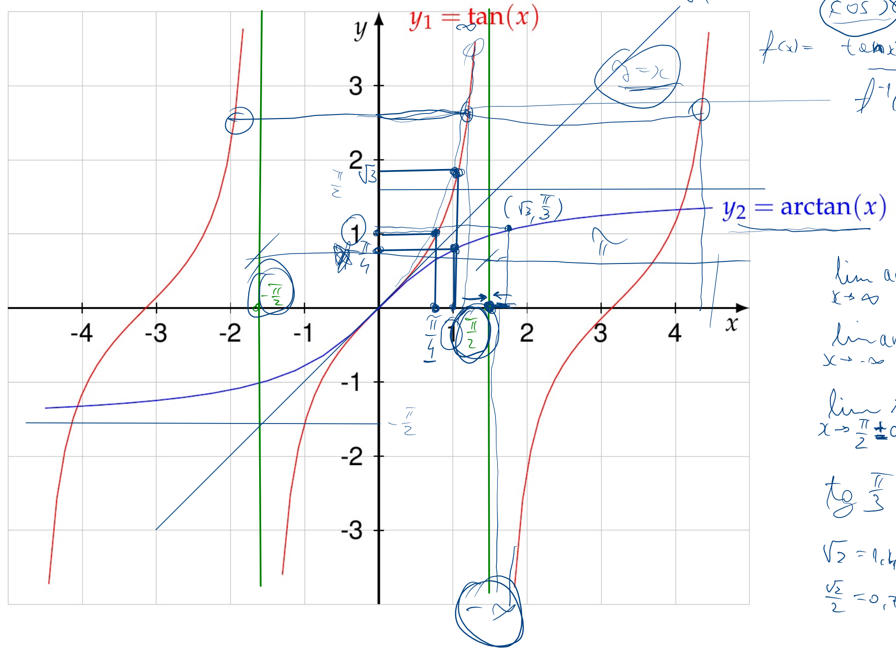
$\frac{60}{180}=\frac{x}{\pi}$ $x=\frac{\pi}{3}=\frac{3{,}14}{3}=1{,}05$

$\frac{x}{180}=\frac{1}{\pi}$ $x=\frac{180}{\pi}=57{,}296$

$57^\circ\ 17'\ 44{,}81''$

Skicirati grafike funkcija $y_1=\tan x$, $y_2=\arctan x$. **Kotirati bitne tačke.**

tg x arctg



$y_1=\tan x=\frac{\sin x}{\cos x} : \mathbb{R}\setminus\{\frac{\pi}{2}+k\pi, k\in\mathbb{Z}\}\to\mathbb{R}$

$f(x)=\tan x : (-\frac{\pi}{2},\frac{\pi}{2}) \xrightarrow{NA, 1-1} \mathbb{R}$

$f^{-1}(x)=\arctan x : \mathbb{R}\to(-\frac{\pi}{2},\frac{\pi}{2})$

$\tan^{-1}$, tg^{-1}

$\lim_{x\to\infty}\operatorname{arctg}x=\frac{\pi}{2}$

$\lim_{x\to-\infty}\operatorname{arctg}x=-\frac{\pi}{2}$

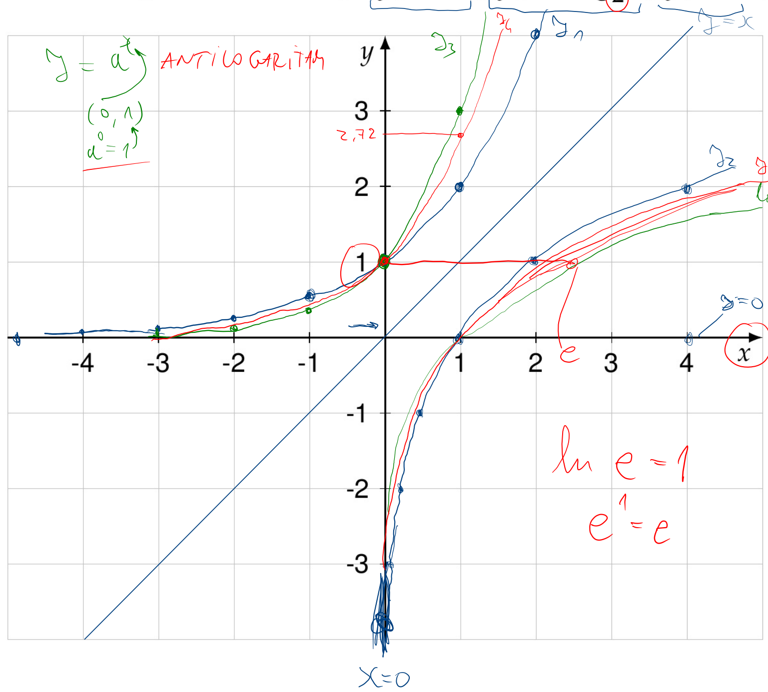
$\lim_{x\to\frac{\pi}{2}\pm0}\operatorname{tg}x=\mp\infty$

$\operatorname{tg}\frac{\pi}{3}=\frac{\sin\frac{\pi}{3}}{\cos\frac{\pi}{3}}=\frac{\frac{\sqrt3}{2}}{\frac12}=\sqrt3\approx1{,}73$

$\sqrt2=1{,}41$

$\frac{\sqrt2}{2}=0{,}707$

Skicirati grafike funkcija $y_1 = 2^x$, $y_2 = \log_2 x$, $y_3 = 3^x$, $y_4 = e^x$.



$2^{-1} = \frac{1}{2}$

x	-3	-2	-1	0	1	2	$\log_2 x$
2^x	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	x
3^x	$\frac{1}{27}$	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9	$\log_3 x$

$2^x : \mathbb{R} \to (0, +\infty)$

$\log_2 x : (0, +\infty) \to \mathbb{R}$

$\lim_{x \to -\infty} 2^x = 2^{-\infty} = \frac{1}{2^\infty} = \frac{1}{\infty} = 0$

$y = 0$ je leva hor. as.

$\lim_{x \to 0_+} \log_2 x = \boxed{-\infty}$

? $e \approx 2{,}72$ Euler

$y = e^x$

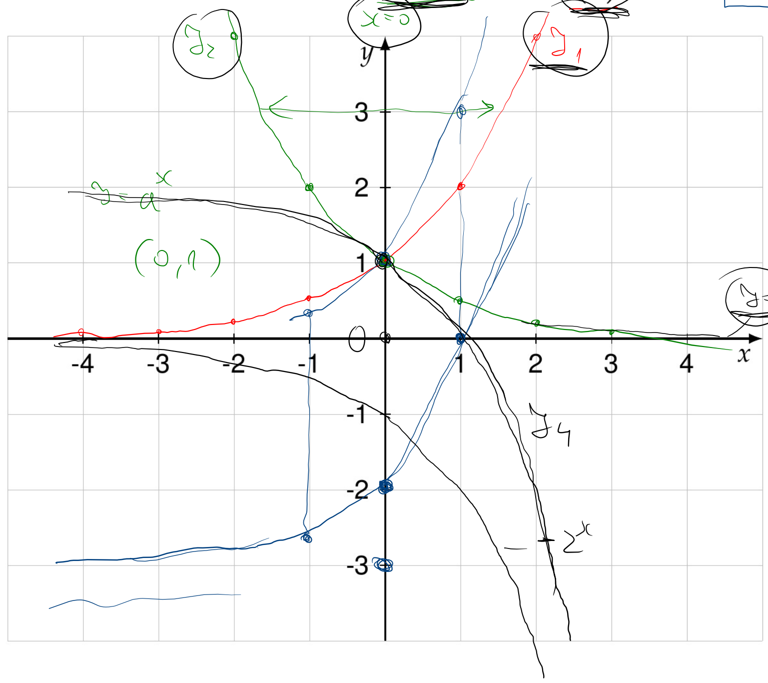
$x = \ln y = \log_e y$

$\ln x : (0, +\infty) \to \mathbb{R}$

$\lim_{x \to 0_+} \ln x = -\infty$

Skicirati grafike funkcija $y_1 = 2^x$, $y_2 = \left(\frac{1}{2}\right)^x$, $y_3 = 3^x - 3$, $y_4 = 2 - 2^x$.

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



x	-3	-2	-1	0	1	2	3
$\left(\frac{1}{2}\right)^x$	8	4	2	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$
3^x	$\frac{1}{27}$	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9	27
$3^x - 3$	$-\frac{80}{27}$	$-\frac{26}{9}$	$-\frac{8}{3}$	-2	0	6	24

Granična vrednost niza

$$A = \lim_{n\to\infty} a_n$$

$$\Leftrightarrow$$

$$\forall \varepsilon > 0\,,\ \exists n_0 \in \mathbb{N}\,,\ \forall n \geq n_0\,,\ |A - a_n| < \varepsilon$$

$n_0(\varepsilon)$

Određeni oblici

$c + \infty = \infty$

$$\infty \cdot \infty = \infty\,,\qquad \infty + \infty = \infty\,,\qquad \infty^\infty = \infty\,,$$

$$\frac{1}{\pm 0} = \pm\infty\,,\qquad \frac{1}{\pm\infty} = 0\,,\qquad \frac{0}{\pm\infty} = 0\,,$$

$$0^\infty = 0\,,\qquad \frac{\infty}{\pm 0} = \pm\infty\,.$$

$c \cdot \infty = \pm\infty$, $c \neq 0$

~~Neodređeni oblici~~

$$\infty - \infty\,,\ 0\cdot\infty\,,\ \tfrac{0}{0}\,,\ \tfrac{\infty}{\infty}\,,\ 1^\infty\,,\ 0^0\,,\ \infty^0\,.$$

Važne granične vrednosti

1. $\displaystyle\lim_{n\to\infty}\frac{1}{n^\alpha} = \begin{cases} 0, & \alpha > 0 \\ 1, & \alpha = 0 \\ +\infty, & \alpha < 0 \end{cases}$

$\lim_{n\to\infty} \frac{1}{\sqrt{n}} = \lim_{n\to\infty} \frac{1}{n^{\frac{1}{2}}} = \frac{1}{\infty} = 0$, $\alpha = \frac{1}{2} > 0$

$n^0 = 1$ $\quad 1, 1, 1, \ldots \xrightarrow[n\to\infty]{} 1$

2. $\displaystyle\lim_{n\to\infty} q^n = \begin{cases} 0, & |q| < 1 \\ 1, & q = 1 \\ +\infty, & q > 1 \end{cases}$

$\lim_{n\to\infty} \left(\frac{1}{2}\right)^n = 0$, $q = \frac{1}{2} < 1$ $\qquad \lim_{n\to\infty} \sqrt{2}^n = \infty$, $\sqrt{2} = 1.41 > 1$

3. $\displaystyle\lim_{\substack{n\to\infty\\ f(n)\to\pm\infty}} \left(1 + \frac{1}{f(n)}\right)^{g(n)} = e^{\lim_{n\to\infty}\frac{g(n)}{f(n)}}$

4. $\displaystyle\lim_{n\to\infty} \frac{n^\alpha}{a^n} = 0$, za $a > 1$ $\qquad \alpha > 0$

$\lim_{n\to\infty} \frac{n^{100}}{1.01^n} = 0$ $\qquad \lim_{n\to\infty} (n^{100} - 1.01^n) = -\infty$

5. $\displaystyle\lim_{n\to\infty} (q^n - r^n) = +\infty$, za $q > r > 1$

6. $\displaystyle\lim_{n\to\infty} (n^\alpha - n^\beta) = +\infty$, za $\alpha > \beta > 0$

$\lim_{n\to\infty} \left(\frac{1}{\sqrt{n}} + \sqrt{2}^n\right) = \lim_{n\to\infty} \frac{1}{\sqrt{n}} + \lim_{n\to\infty} \sqrt{2}^n = 0 + \infty = \infty$

$\lim_{n\to\infty} \left(\sqrt{3}^n - \sqrt{2}^n\right) = \infty - \infty = \infty$ $\qquad (1.73,\ 1.41)$

$\lim_{n\to\infty} \left(\sqrt{2}^n - \sqrt{3}^n\right) = -\infty$

$\sqrt{n^3} = n^{\frac{3}{2}} = n^{1.5}$ $\qquad 10^{\frac{3}{2}}$ $\qquad$ $10^{1.5}$

Izračunati:

1. $\displaystyle\lim_{n\to\infty}\frac{n+1}{\sqrt{n^3}} = \lim_{n\to\infty} \frac{n}{\sqrt{n^3}} + \lim_{n\to\infty} \frac{1}{\sqrt{n^3}} = \lim_{n\to\infty} \frac{1}{n^{\frac{1}{2}}} + \lim_{n\to\infty} \frac{1}{n^{\frac{3}{2}}} = 0 + 0 = 0$

2. $\displaystyle\lim_{n\to\infty}\frac{n^2+3n}{n-2^n} = \lim_{n\to\infty} \frac{\frac{n^2}{2^n} + 3\cdot\frac{n}{2^n}}{\frac{n}{2^n} - 1} = \frac{0 + 3\cdot 0}{0 - 1} = \frac{0}{-1} = 0$

3. $\displaystyle\lim_{n\to\infty}\frac{n^2+3^n}{n-2^n} \cdot \frac{2^{-n}}{2^{-n}} = \lim_{n\to\infty} \frac{\frac{n^2}{2^n} + \left(\frac{3}{2}\right)^n}{\frac{n}{2^n} - 1} = \frac{\infty}{-1} = -\infty$

4. $\displaystyle\lim_{n\to\infty}\frac{1.1^n}{100^n} = 0$ $\qquad \lim_{n\to\infty} \frac{1.1^n}{n^{100}} = \infty$

$(\sqrt{a} - \sqrt{b}) \cdot (\sqrt{a} + \sqrt{b}) = a - b$

5. $\displaystyle\lim_{n\to\infty}\frac{\sqrt{n^2+n+1}-\sqrt{n^2+3n-1}}{n+3} \cdot \frac{\sqrt{n^2+n+1} + \sqrt{n^2+3n-1}}{\sqrt{n^2+n+1} + \sqrt{n^2+3n-1}} =$

$= \lim_{n\to\infty} \frac{n^2 + n + 1 - n^2 - 3n + 1}{(n+3)\cdot(\sqrt{} + \sqrt{})} = \lim_{n\to\infty} \frac{-2n+2}{(n+3)\cdot(\sqrt{} + \sqrt{})} \cdot \frac{\frac{1}{n}}{\frac{1}{n}} =$

$= \lim_{n\to\infty} \frac{-2 + \frac{2}{n}}{\left(1 + \frac{3}{n}\right)\cdot\left(\sqrt{n^2+n+1} + \sqrt{n^2+3n-1}\right)} = \frac{-2}{\infty} = -2 \cdot \frac{1}{\infty} = -2 \cdot 0 = 0$

Granična vrednost funkcije

$$\lim_{x\to a} f(x) = l \Leftrightarrow$$

$$\forall\epsilon > 0\ \exists\delta > 0\ (0 < |x-a| < \delta \Rightarrow |f(x) - l| < \epsilon)$$

Ako granične vrednosti postoje, važi:

$$\lim_{x\to a}(\alpha f(x) + \beta g(x)) = \alpha \lim_{x\to a} f(x) + \beta \lim_{x\to a} g(x)$$

$$\lim_{x\to a}(f(x)\cdot g(x)) = \lim_{x\to a} f(x)\cdot \lim_{x\to a} g(x)$$

$$\lim_{x\to a}\frac{f(x)}{g(x)} = \frac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)},\quad \lim_{x\to a} g(x) \neq 0$$

$$\lim_{x\to a} h(f(x)) = h\left(\lim_{x\to a} f(x)\right),\ h \text{ neprekidno.}$$

Važne granične vrednosti

1. $\lim_{x\to 0}\frac{\sin x}{x} = 1$
2. $\lim_{x\to\pm\infty}\left(1+\frac{1}{x}\right)^x = e$
3. $\lim_{x\to 0}(1+x)^{\frac{1}{x}} = e$
4. $\lim_{x\to 0}\frac{e^x-1}{x} = 1$
5. $\lim_{x\to 0}\frac{\ln(1+x)}{x} = 1$
6. $\lim_{x\to\infty}\arctan x = \pi/2$

Izračunati:

1. $\lim_{x\to\infty}\frac{x^2+3x}{2x^3-4x}$, $\cdot\frac{x^{-3}}{x^{-3}}$ $\lim_{x\to\infty}\frac{\frac{1}{x}+\frac{3}{x^2}}{2-\frac{4}{x^2}} = \frac{0}{2} = 0$??

   $\frac{\infty}{\infty}$

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

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

   $4x - 2x^2$

4. $\lim_{x\to 0}\frac{x^2+3x}{2x^3-4x}$, $\cdot\frac{x^{-1}}{x^{-1}} = \lim_{x\to 0}\frac{x+3}{2x^2-4} = \frac{3}{-4} = -\frac{3}{4}$

   $\frac{0}{0}$??

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

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

   $0+3=3$

   $x=0.1$ $\quad 2\times 0.01 - 4\times 0.1 = -0.38$

Granična vrednost funkcije

$$\lim_{x\to a} f(x) = l \Leftrightarrow$$

$$\forall \epsilon > 0\ \exists \delta > 0\ (0 < |x-a| < \delta \Rightarrow |f(x) - l| < \epsilon)$$

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$$\lim_{x\to a}(f(x)\cdot g(x)) = \lim_{x\to a} f(x) \cdot \lim_{x\to a} g(x)$$

$$\lim_{x\to a}\frac{f(x)}{g(x)} = \frac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}, \quad \lim_{x\to a} g(x) \neq 0$$

$$\lim_{x\to a} h(f(x)) = h\left(\lim_{x\to a} f(x)\right),\ h \text{ neprekidno}$$

Važne granične vrednosti

1. $\lim_{x\to 0}\frac{\sin x}{x} = 1$
2. $\lim_{x\to\pm\infty}\left(1+\frac{1}{x}\right)^x = e$
3. $\lim_{x\to 0}(1+x)^{\frac{1}{x}} = e$
4. $\lim_{x\to 0}\frac{e^x - 1}{x} = 1$
5. $\lim_{x\to 0}\frac{\ln(1+x)}{x} = 1$
6. $\lim_{x\to\infty}\arctan x = \pi/2$

$a^2 - b^2 = (a-b)(a+b)$

$ax^2 + bx + c = a(x-x_1)\cdot(x-x_2)$

Izračunati:

1. $\lim_{x\to 2}\frac{x^2-4}{x^2-5x+6}$, $= \lim_{x\to 2}\frac{\cancel{(x-2)}(x+2)}{(x-3)\cancel{(x-2)}} = \lim_{x\to 2}\frac{x+2}{x-3} = \frac{4}{-1} = -4$

   $4-4=0$, $4-10+6=0$, $\frac{0}{0}$

   $x_{1,2} = \frac{5\pm\sqrt{25-24}}{2}$ — 3, 2

2. $\lim_{x\to 4^+}\frac{\sqrt{x}-2}{\sqrt{x-4}}$, $\cdot\frac{\sqrt{x}+2}{\sqrt{x}+2}\cdot\frac{\sqrt{x-4}}{\sqrt{x-4}} = \lim_{x\to 4^+}\frac{\cancel{(x-4)}\cdot\sqrt{x-4}}{(\sqrt{x}+2)\cancel{(x-4)}} = \frac{0}{4} = 0$

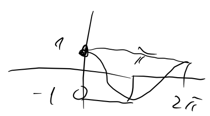
   $\frac{0}{0}$, $2+2$

7. $\lim_{x\to 0}\frac{\arcsin x}{x} = 1$

8. $\lim_{x\to 0}\frac{\operatorname{arctg} x}{x} = 1$

3. $\lim_{x\to 0}\frac{\sqrt{1+x}-1}{x}$. $\cdot\frac{\sqrt{1+x}+1}{\sqrt{1+x}+1} = \lim_{x\to 0}\frac{\cancel{1}+x-\cancel{1}}{\cancel{x}(\sqrt{1+x}+1)} = \lim_{x\to 0}\frac{1}{\sqrt{1+x}+1} = \frac{1}{2}$

   $\frac{0}{0}$



4. $\lim_{x\to 0}\frac{\tan x}{x}$. $= \lim_{x\to 0}\frac{\frac{\sin x}{\cos x}}{x} = \lim_{x\to 0}\frac{\sin x}{x}\cdot\lim_{x\to 0}\frac{1}{\cos x} = 1$

9. $\lim_{x\to 0}\frac{1-\cos x}{x^2} = \frac{1}{2}$

5. $\lim_{x\to 0}\frac{1-\cos x}{x^2}$. $= \lim_{x\to 0}\frac{2\cdot\sin^2\frac{x}{2}}{\left(\frac{x}{2}\right)^2\cdot 4} = \frac{2}{4}\cdot\lim_{x\to 0}\left(\frac{\sin\frac{x}{2}}{\frac{x}{2}}\right)^2 = \frac{1}{2}\cdot\left(\lim_{t\to 0}\frac{\sin t}{t}\right)^2 = \frac{1}{2}\cdot 1^2 = \frac{1}{2}$

   $\frac{x}{2} = t$, $x\to 0$, $t\to 0$

   $1-\cos x = 2\cdot\sin^2\frac{x}{2}$

$\cos(2x) = \cos^2 x - \sin^2 x \quad /\cdot(-1)$

$1 = \cos^2 x + \sin^2 x$

$1 - \cos(2x) = 2\cdot\sin^2 x$

1. Koristeći kalkulator rešiti jednačinu $1.16\,x^2 - 0.32\,x - 1.361364 = 0$.

$a = 1.16$

$b = -0.32$

$c = -1.361364$

$x_{1,2} = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

$x_1 = (+0.32 - 2.5336)/2/1.16 = \underline{-0.954138\cancel{00}}$!!

79310

$D = b^2 - 4ac = 0.32^2 + 4 \times 1.16 \times 1.361364 = 6.41912896$

$= 2.5336^2$

!!

$x_2 = (0.32 + 2.5336)/2/1.16 = \underline{1.230000}$

2. Koristeći kalkulator izračunati graničnu vrednost $\lim\limits_{n\to\infty}(\underbrace{\sqrt{n^2+4n+1} - \sqrt{n^2+n}}_{a_n}) = 1.5 = \dfrac{3}{2}$.

$a - b$ $\infty - \infty$

$(a-b)\cdot\dfrac{a+b}{a+b} = \dfrac{a^2-b^2}{a+b}$

$n = 100$: $a_{100} = \sqrt{10401} - \sqrt{10100} = 1.4865 \approx \underline{1.5}$

$a_{1000} = \sqrt{1004001} - \sqrt{1001000} = \underline{1.4986}$

$= \dfrac{3}{2}$

Domaći $a_{10000} =$

3. Koristeći kalkulator izračunati graničnu vrednost $\lim\limits_{x\to 0}\dfrac{1-\cos x}{x^2}$. $= \dfrac{1}{2}$

!! RAD !!

$f(x) = \dfrac{1-\cos x}{x^2} = \dfrac{1-\cos 0.01}{0.0001} = \underline{0.499996} \approx \dfrac{1}{2}$

$x = 0.01$

Izvod funkcije

$$f'(x)=\lim_{\Delta x\to 0}\frac{f(x+\Delta x)-f(x)}{\Delta x}$$

Ako funkcija ima prvi izvod u tački x, kažemo da je **diferencijabilna** u toj tački.

Osobine izvoda

1. $(\alpha f(x)+\beta g(x))'=\alpha f'(x)+\beta g'(x)$
2. $(f(x)\cdot g(x))'=f'(x)g(x)+f(x)g'(x)$
3. $\left(\frac{f(x)}{g(x)}\right)'=\frac{f'(x)g(x)-f(x)g'(x)}{g^2(x)}$
4. $(f(g(x)))'=f'(g(x))g'(x)$

Pokazati po definiciji da je $(x^2-x+1)'=2x-1$.

$$\lim_{\Delta x\to 0}\frac{(x+\Delta x)^2-(x+\Delta x)+1-(x^2-x+1)}{\Delta x}=$$

$$=\lim_{\Delta x\to 0}\frac{x^2+2x\Delta x+\Delta x^2-x-\Delta x+1-x^2+x-1}{\Delta x}=$$

$$=\lim_{\Delta x\to 0}\left(\frac{\Delta x(2x-1)}{\Delta x}+\Delta x\right)=2x-1$$

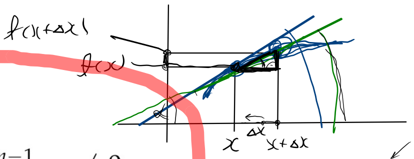
Naći po definiciji izvod funkcije $f(x)=\sqrt{x}$

$$(\sqrt{x})'=\lim_{\Delta x\to 0}\frac{\sqrt{x+\Delta x}-\sqrt{x}}{\Delta x}\cdot\frac{\sqrt{x+\Delta x}+\sqrt{x}}{\sqrt{x+\Delta x}+\sqrt{x}}=\lim_{\Delta x\to 0}\frac{1}{\sqrt{x+\Delta x}+\sqrt{x}}\cdot\lim_{\Delta x\to 0}\frac{x+\Delta x-x}{\Delta x}=$$

$$=\frac{1}{2\sqrt{x}}$$

$$(\sqrt{x})'=(x^{\frac12})'=\frac12\cdot x^{\frac12-1}=\frac{1}{2\cdot x^{\frac12}}=\frac{1}{2\sqrt{x}}$$

Tablica izvoda



i) $c'=0$

ii) $(x^n)'=nx^{n-1}$, $n\neq 0$

iii) $(\log_a x)'=\frac{1}{x\ln a}$ $=\frac{1}{x}$

iv) $(a^x)'=a^x\ln a$ $=e^x$

v) $(\sin x)'=\cos x$

vi) $(\cos x)'=-\sin x$

vii) $(\arcsin x)'=\frac{1}{\sqrt{1-x^2}}$

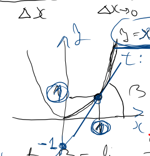
viii) $(\operatorname{arctg} x)'=\frac{1}{1+x^2}$

$(x^2)'=2x$

$(x^3)'=3x^2$

$\operatorname{tg}\alpha=\frac{f(x+\Delta x)-f(x)}{\Delta x}\xrightarrow{\Delta x\to 0}\operatorname{tg}\beta=f'(x)$

$y=x^2$



$y=2x-1$

$t: y=kx+n$

$y=2x+n$

$k=\operatorname{tg}\beta=\lim_{\Delta x\to 0}\frac{(1+\Delta x)^2-1}{\Delta x}=\lim_{\Delta x\to 0}\frac{\cancel{1}+2\Delta x+\Delta x^2-\cancel{1}}{\Delta x}=\lim_{\Delta x\to 0}(2+\Delta x)=2$

$(\ln x)'=\frac{1}{x}$

$\boxed{(e^x)'=e^x}$

$\left(\frac{f}{g}\right)'=\frac{f'g-fg'}{g^2}$

Izvod funkcije

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

Ako funkcija ima prvi izvod u tački x, kažemo da je **diferencijabilna** u toj tački.

Osobine izvoda

1. $(\alpha f(x) + \beta g(x))' = \alpha f'(x) + \beta g'(x)$
2. $(f(x) \cdot g(x))' = f'(x)g(x) + f(x)g'(x)$
3. $\left(\frac{f(x)}{g(x)}\right)' = \frac{f'(x)g(x) - f(x)g'(x)}{g^2(x)}$
4. $(f(g(x)))' = f'(g(x))g'(x)$

Tablica izvoda

i) $c' = 0$

ii) $(x^n)' = nx^{n-1}$, $n \neq 0$

iii) $(\log_a x)' = \frac{1}{x \ln a}$

iv) $(a^x)' = a^x \ln a$

v) $(\sin x)' = \cos x$

vi) $(\cos x)' = -\sin x$

vii) $(\arcsin x)' = \frac{1}{\sqrt{1-x^2}}$

viii) $(\operatorname{arctg} x)' = \frac{1}{1+x^2}$

$\boxed{\left(\frac{1}{x}\right)' = -\frac{1}{x^2}}$

$(x^{-1})' = -x^{-2} = -\frac{1}{x^2}$

$(e^x)' = e^x$

$(\sqrt{x})' = \frac{1}{2\sqrt{x}}$

$(x^2)' = 2x$

$x' = 1$

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

$\frac{\sqrt{2}}{2\sqrt{x}}$

$y' = \frac{3}{2} \cdot \sqrt{x} - 3 \cdot \cos x + \frac{1}{x^2} + \frac{2}{x}$

2. $y = (x^2 + x)^2 - e^{3+x} + \sqrt{2x}$, $\quad y' = (x^4 + 2x^3 + x^2)' - (e^3 \cdot e^x)' + (\sqrt{2} \cdot \sqrt{x})'$

$y' = 4x^3 + 6x^2 + 2x - e^3 \cdot e^x + \frac{1}{\sqrt{2\cancel{x}}}$

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

3. $y = \frac{x}{\sqrt{x}} + 2\cos x + \ln(2x)$, $\quad y' =$

$\ln 2 + \ln x$

$\frac{1}{x}$

4. $y = \frac{1}{x\sqrt{x}} - \frac{1}{e^{-x}} + \log_2 x$, $\quad y' =$