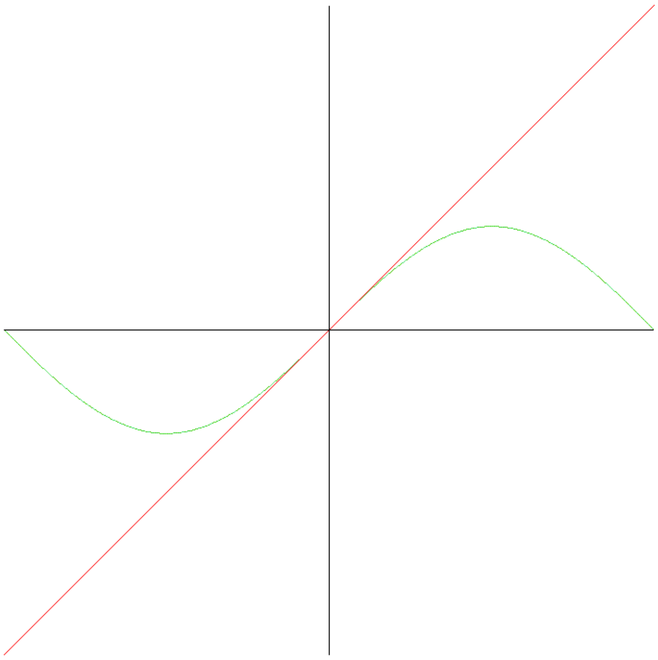
Mějme graf $y = \sin(x)$ na intervalu $[-\pi, \pi]$.
Priblizime se k pocatku a objevime "linearni chovani"

```
> with(plots):
> picfn:= x->plot([t,x*sin(t/x)], t=-Pi..Pi,tickmarks=[0, 0]);
```

$$picfn := x \to \mathrm{plot}\left(\left[t, x\sin\left(\frac{t}{x}\right)\right], t = -\pi .. \pi, tickmarks = [0, 0]\right)$$

```
> display( [seq(picfn(x/10), x=10..60)], insequence=true);
```



```
>
> Limit((sin(h)-sin(0))/h, h=0)=limit((sin(h)-sin(0))/h, h=0);
```

$$\lim_{h \to 0} \frac{\sin(h)}{h} = 1$$

```
>
```

Definice: Nechť $f(x)$ je funkce definovaná v $x = a$. Říkáme, že *derivace* $f(x)$ v $x = a$ existuje, pokud existuje

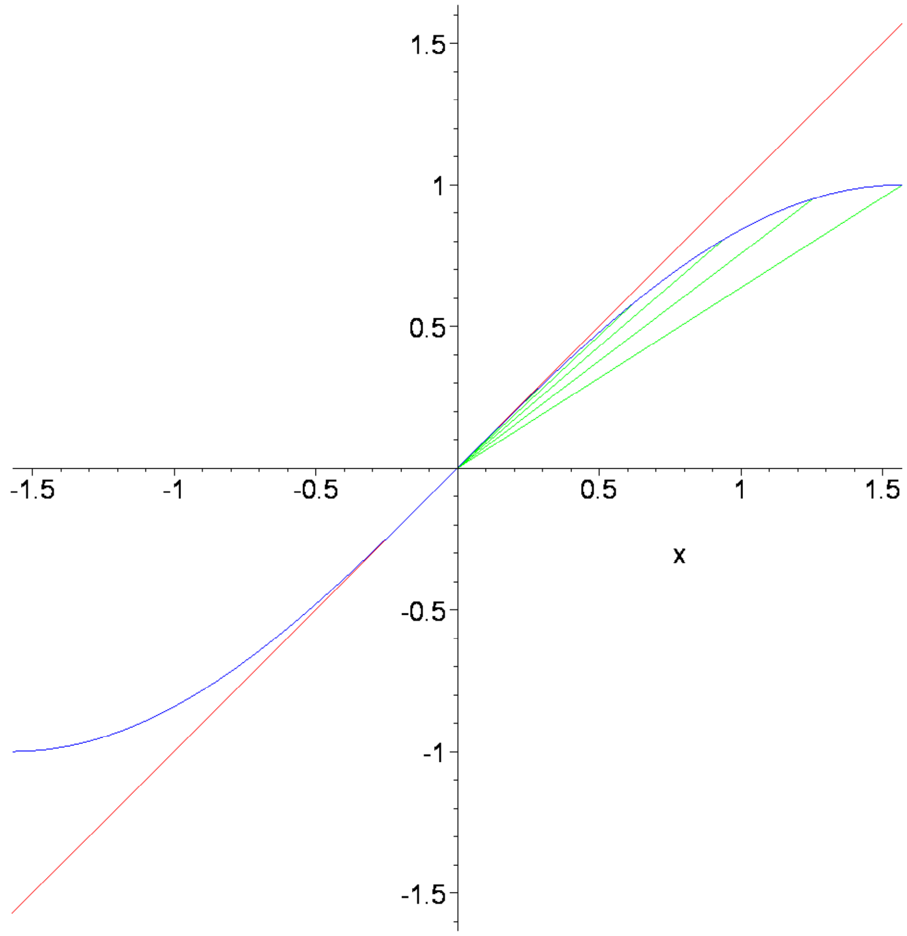
$$\lim_{h \to 0} \frac{f(a+h) - f(a)}{h},$$

její hodnotu označíme $f'(a)$ a nazýváne *derivací* $f(x)$ *v bode* $x = a$

Nasledujici procedura je obecna
funguje napr. pro
sin, exp, arctan, x^2, x^2+1,
f funkce
(a,b) interval
t bod v nemz hledame derivaci
p pocet secen

```
> f:=x-> sin(x):
```

```
> a:=-Pi/2:b:=Pi/2:
> t:=0:
> p:=5:
> Plot1 := plot(f(x), x=a..b, color=blue):
> Plot2 := seq(plottools[line]([t,f(t)],
  [t+(b-t)*i/p,f(t+(b-t)*i/p)], color=green), i=1..p):
> Plot3 := plot(subs(x=t,diff(f(x),x))*(x-t)+f(t), x=a..b,
  color=red):
> plots[display]([Plot1, Plot2, Plot3], scaling=constrained);
```




```
>
>
```

Maple V to derivace hleda příkazem **diff** (*differentiation*).

Zkusíme to na $f(x) = \sin(x)$.

```
> f:=x->sin(x);
```

$$f := x \rightarrow \sin(x)$$

```
> evalf(subs(x=0, diff(f(x),x)));
```

$$1.$$

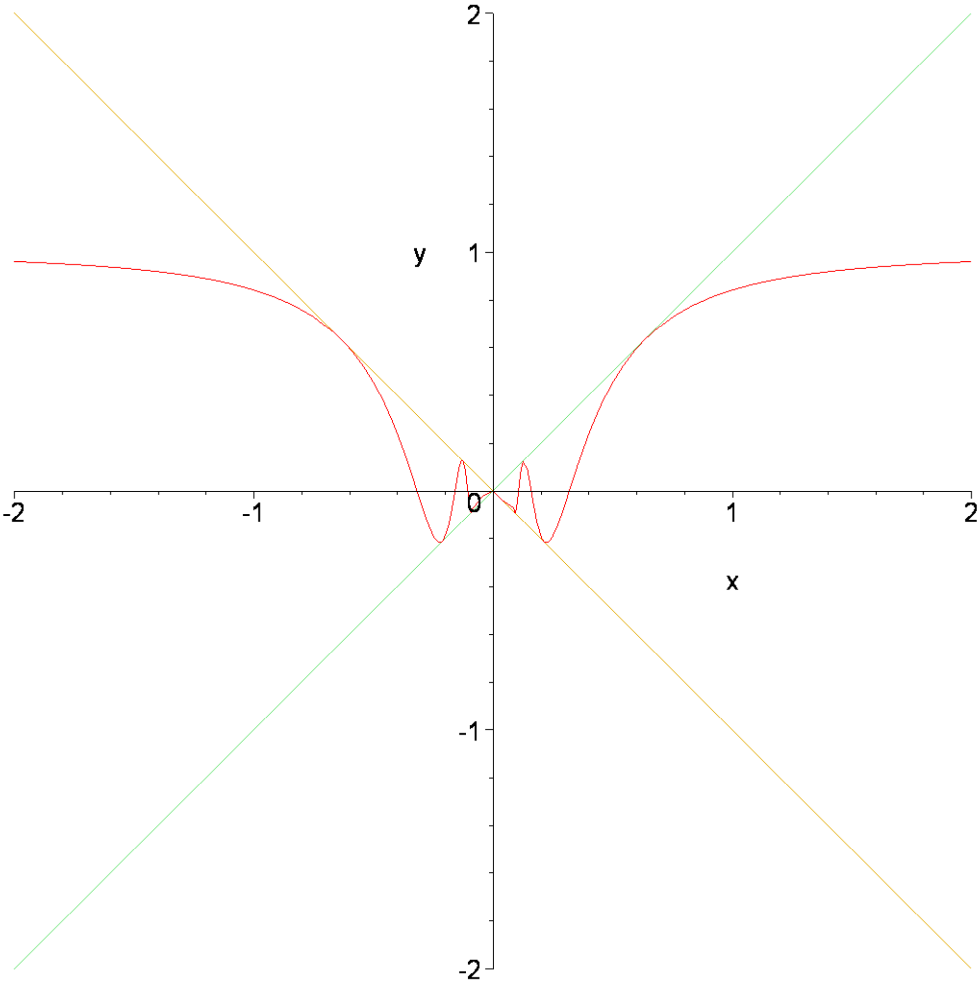
```
>
```

ale tuhle funkci take zvladne

```
> f:=x-> piecewise(x<0,x*sin(1/x),x=0,0,x>0,x*sin(1/x));
```

$$f := x \to \text{piecewise}\left(x < 0,\ x\sin\left(\frac{1}{x}\right),\ x = 0,\ 0,\ 0 < x,\ x\sin\left(\frac{1}{x}\right)\right)$$

```
> plot([f(x),x,-x],x=-2..2,y=-2..2,scaling=constrained);
```




```
> evalf(subs(x=0, diff(f(x),x)));
Error, numeric exception: division by zero
> diff(f(x),x);
```

$$\begin{cases} -1 \,..\, 1 & x = 0 \\ \sin\left(\frac{1}{x}\right) - \dfrac{\cos\left(\frac{1}{x}\right)}{x} & \textit{otherwise} \end{cases}$$

```
>
>
```

funkce sign a signum se trochu lisi
nastavime si hodnotu funkce signum v pocatku

```
> _Envsignum0:=0;
```

$$\_Envsignum0 := 0$$

```
> f:=x->signum(x);
```

$$f := x \rightarrow \mathrm{signum}(x)$$

```
> signum(0);
```

$$0$$

```
> sign(0);
```

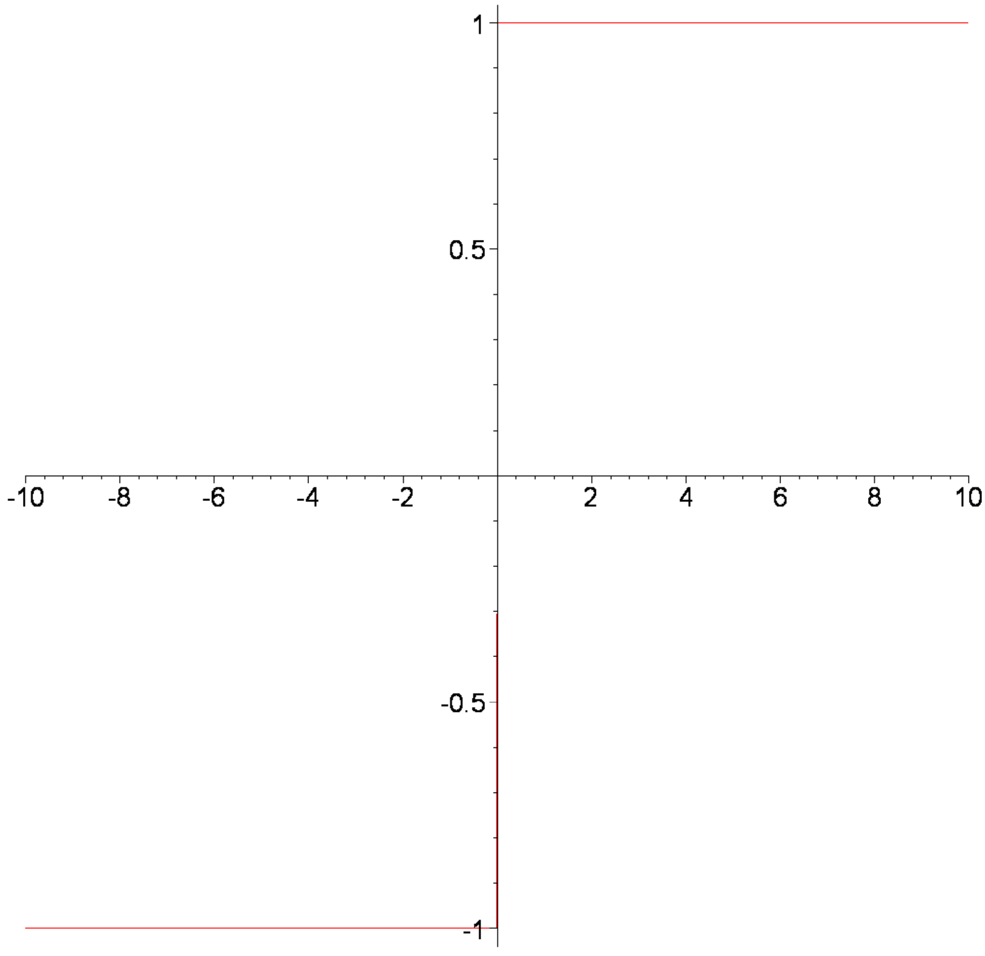
$$1$$

```
> diff(f(x),x);
```

$$\mathrm{signum}(1, x)$$

to je formalni derivace signum, jeji vyznam je definovan ...

```
> plot(f);
```




```
>
>
>
```