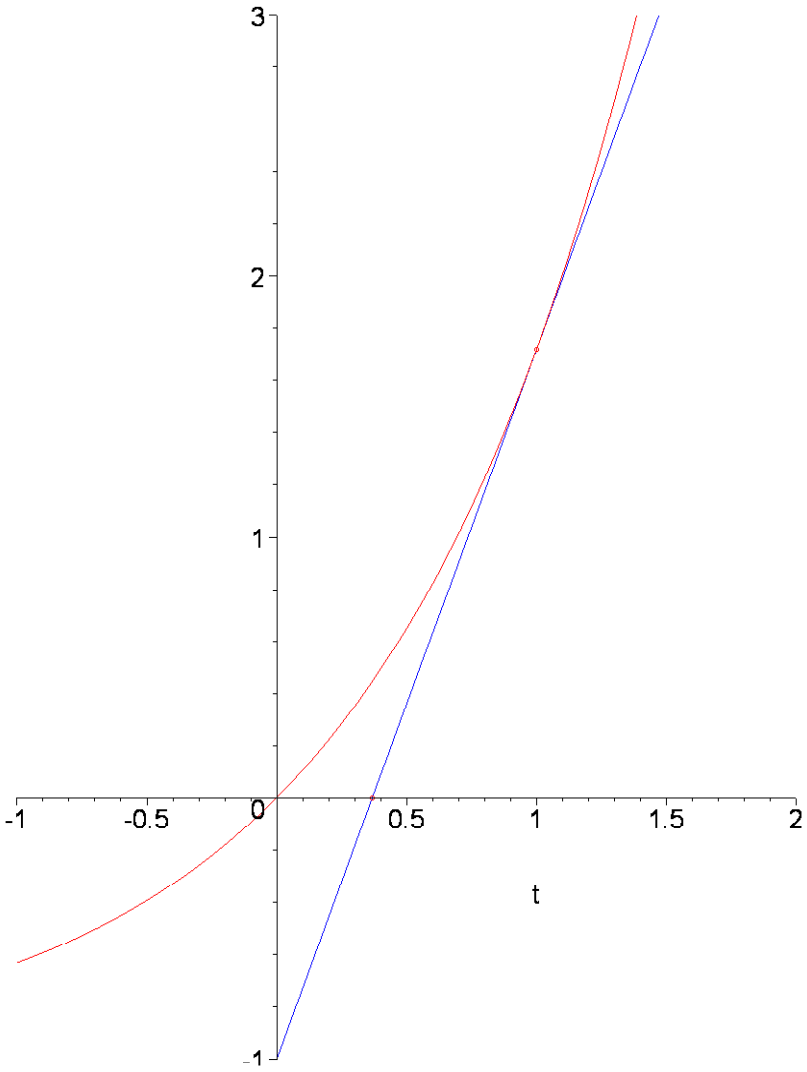
```
> restart:
```

Newtonova metoda

Uděláme odhad $x_0$ řešení $f(x) = 0$ a pak aplikujeme formulku $x_{n+1} = x_n - \frac{f(x_n)}{D(f)(x_n)}$

tim dostanem prusecik tecny ke grafu funkce v bode $x_0$ s osou x, ten oznacime $x_1$ a pokracujeme dale ...




```
>
> f := x -> exp(x)-1;
```

$$f := x \to \mathbf{e}^x - 1$$

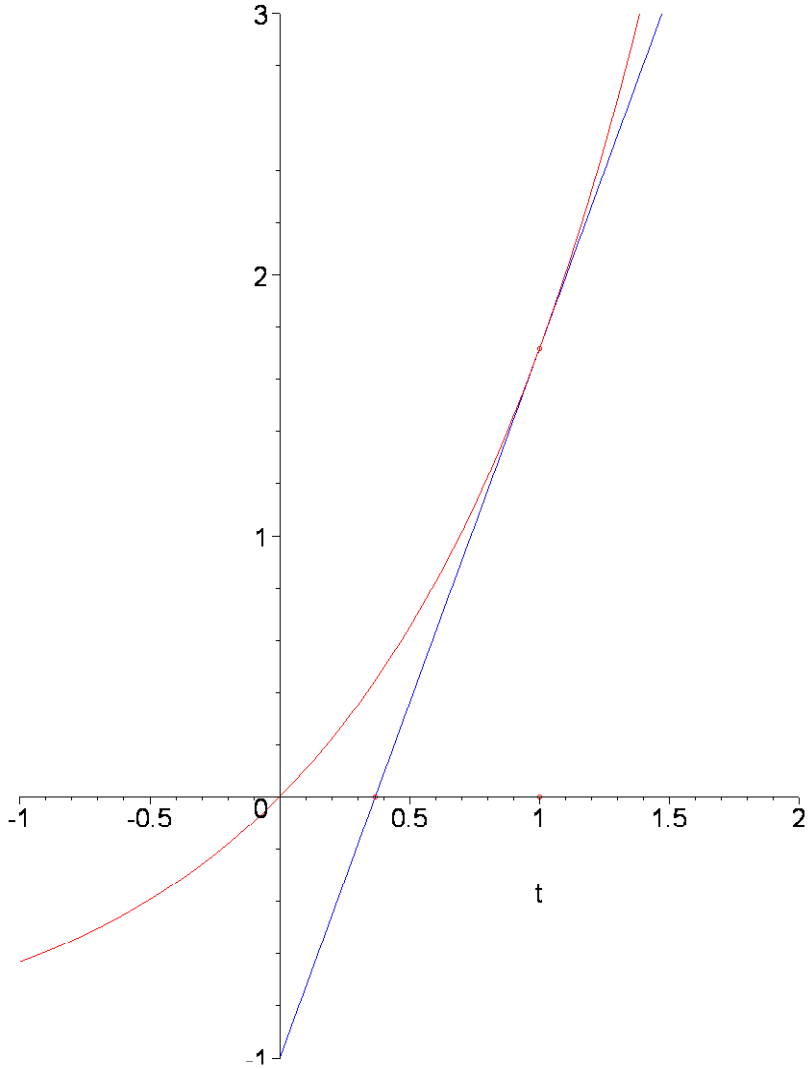
```
> x:=1:
> a:=-1:b:=2: c:=-1: d:=3:
>
>
>
```

s temito volbami funguje dalsi postup, k x =x_0 dostaneme xx=x_1

```
> Digits:=10:
> xx:=evalf(x - f(x)/D(f)(x));
```

$$xx := 0.3678794412$$

```
> with(plots):
> plot1:=plot(f,a..b,c..d):
> plot2:=plot([[x,0],[x,f(x)],[xx,0]], style=POINT,
  symbol=CIRCLE):
> plot3:=plot(f(x) + subs(s=x,D(f)(s))*(t-x), t=a..b,c..d,
  color=blue):
> display(plot1, plot2, plot3, scaling=constrained);
```




timto pomoci funkce N (nasledujici) priradime danemu x dalsi x, tedy k x_0 dostaneme x_1 a toto opakujeme:

```
> N := x -> evalf(x - f(x)/D(f)(x));
```

$$N := x \to \mathrm{evalf}\left(x - \frac{\mathrm{f}(x)}{\mathrm{D}(f)(x)}\right)$$

```
> Digits:=20;
```

$$Digits := 20$$

```
> L := [seq(i,i=1..11)];
```

$$L := [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]$$

```
> L[1]:=x:
> for i from 1 by 1 to 10 do  L[i+1]:=evalf(N(L[i]))  end do;
```

$$L_2 := 0.36787944117144232159$$

$$L_3 := 0.06008006872678867544$$

$$L_4 := 0.001769199442644681625$$

$$L_5 := 0.15641107899702743\ 10^{-5}$$

$$L_6 := 0.12232206376020\ 10^{-11}$$

$$L_7 := 0.376034962686\ 10^{-19}$$

$$L_8 := 0.376034962686\ 10^{-19}$$

$$L_9 := 0.376034962686\ 10^{-19}$$

$$L_{10} := 0.376034962686\ 10^{-19}$$

$$L_{11} := 0.376034962686\ 10^{-19}$$

```
> L;
```

$$[1, 0.36787944117144232159, 0.06008006872678867544, 0.001769199442644681625, 0.15641107899702743\ 10^{-5}, 0.12232206376020\ 10^{-11}, 0.376034962686\ 10^{-19}, 0.376034962686\ 10^{-19}, 0.376034962686\ 10^{-19}, 0.376034962686\ 10^{-19}, 0.376034962686\ 10^{-19}]$$

Spocteme rucne 10 aproximaci na 20 desetinnych mist:

```
> Digits:=20;
```

$$Digits := 20$$

```
> x:=N(x);
```

$$x := 0.36787944117144232159$$

```
> x:=N(x);
```

$$x := 0.06008006872678867544$$

```
> x:=N(x);
```

$$x := 0.001769199442644681625$$

```
> x:=N(x);
```

$$x := 0.15641107899702743\ 10^{-5}$$

```
> x:=N(x);
```

$$x := 0.12232206376020\ 10^{-11}$$

```
> x:=N(x);
```

$$x := 0.376034962686\ 10^{-19}$$

```
> x:=N(x);
```

$$x := 0.376034962686\ 10^{-19}$$

```
> x:=N(x);
```

$$x := 0.376034962686\ 10^{-19}$$

```
> x:=N(x);
```

$$x := 0.376034962686\ 10^{-19}$$

```
> x:=N(x);
```

$$x := 0.376034962686\ 10^{-19}$$

```
> solve(f(u)=0,u);
```

$$0$$

```
> evalf(%);
```

$$0.$$

```
> chyba:=x-%;
```

$$chyba := 0.376034962686\ 10^{-19}$$

```
> Digits:=10;
```

$$Digits := 10$$

dalsi volby

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

$$f := x \to \cos(x) - \sin(x)$$

```
> x:=0:
> a:=-Pi:b:=Pi: c:=-2: d:=2:
>
>
> f := x -> ln(x);
```

$$f := x \to \ln(x)$$

```
> x:=1/2:
> a:=-1/10:b:=3: c:=-2: d:=2:
>
>
> f := x -> x^2-1;
```

$$f := x \to x^2 - 1$$

```
> x:=2:
> a:=-5:b:=5: c:=-5: d:=5:
>
>
> f := x -> cos(x);
```

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

```
> x:=1/2:
```

```
> a:=0:b:=Pi: c:=-2: d:=2:
>
```

a tady se procedura zacykli:

```
> f := x -> signum(x)*sqrt(abs(x));
```

$$f := x \to \mathrm{signum}(x)\sqrt{|x|}$$

```
> x:=4:
> a:=-5:b:=5: c:=-2: d:=2:
>
>
```