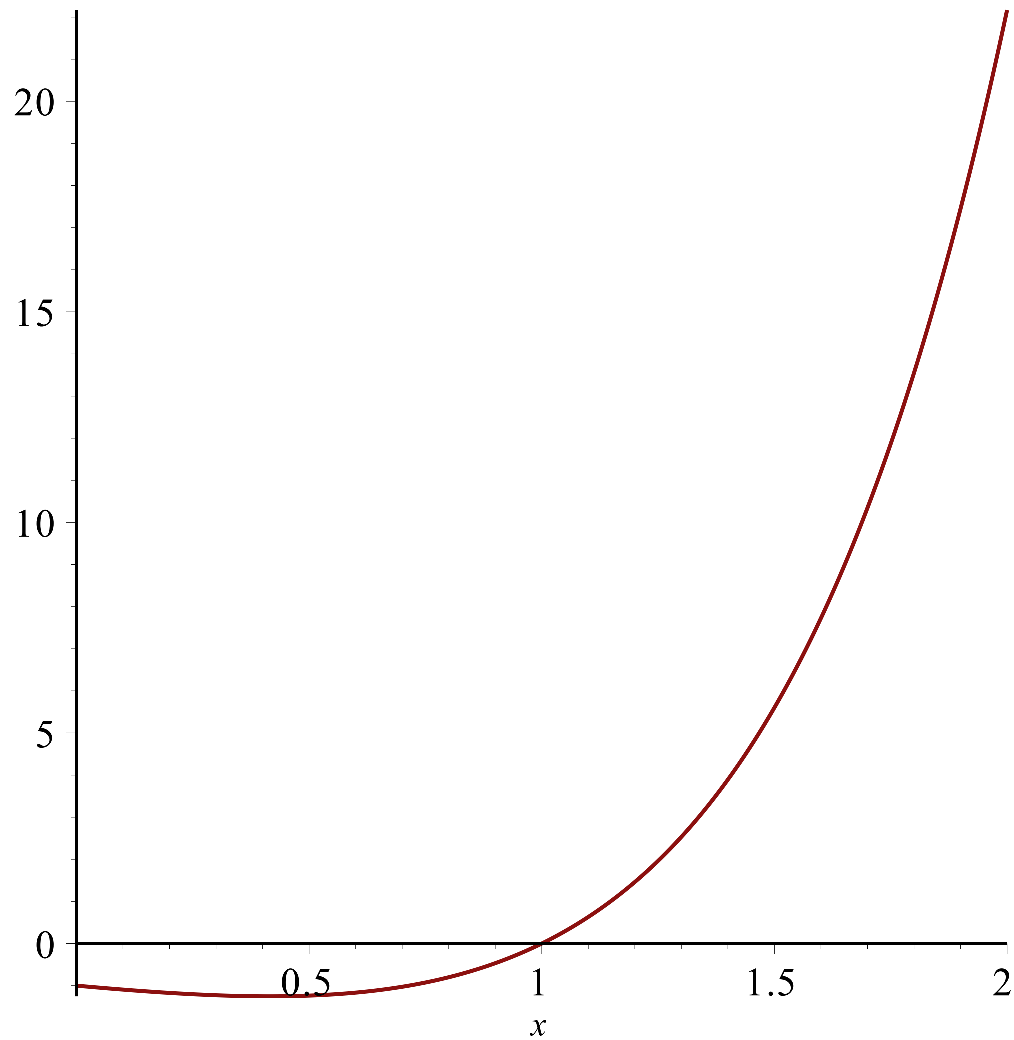
Stima a posteriori ordine di convergenza metodo di Newton e Secanti

Metodo iterativo di Newton

```
> restart:
> with(plots):
> f := x -> (x^2 - 1)*exp(x) ;
```

$$f := x \rightarrow \left(x^2 - 1\right) e^x \quad (1)$$

```
> plot(f(x),x=0..2) ;
```




```
> SOL := solve( f(x), {x} ) ;
```

$$SOL := \{x = 1\}, \{x = -1\} \quad (2)$$

```
> df := D(f) ;
```

$$df := x \rightarrow 2\, x\, e^x + \left(x^2 - 1\right) e^x \quad (3)$$

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

$$N := x \rightarrow x - \frac{f(x)}{df(x)} \quad (4)$$

```
> alpha := subs(evalf(SOL[1],50),x) ;
```

$$\alpha := 1. \quad (5)$$

```
> x0 := 0.8 ;
  x1 := evalf(N(x0),50) ;
  x2 := evalf(N(x1),50) ;
  x3 := evalf(N(x2),50) ;
  x4 := evalf(N(x3),50) ;
  x5 := evalf(N(x4),50) ;
```

$$x0 := 0.8$$

$$x1 := 1.0903225806451612903225806451612903225806451612903$$

$$x2 := 1.0106401859573209361786042547597163493522433765171$$

$$x3 := 1.0001668623050135572246493388357272556247145740181$$

$$x4 := 1.0000000417529316655394322967098407103046502153459$$

$$x5 := 1.0000000000000026149607720303443633165282386476863 \quad (6)$$

```
> e0 := abs(x0-alpha) ;
  e1 := abs(x1-alpha) ;
  e2 := abs(x2-alpha) ;
  e3 := abs(x3-alpha) ;
  e4 := abs(x4-alpha) ;
  e5 := abs(x5-alpha) ;
```

$$e0 := 0.2$$

$$e1 := 0.090322581$$

$$e2 := 0.010640186$$

$$e3 := 0.000166862$$

$$e4 := 4.2\ 10^{-8}$$

$$e5 := 0. \quad (7)$$

```
> p := log(e2/e1)/log(e1/e0) ;
  p := log(e3/e2)/log(e2/e1) ;
  p := log(e4/e3)/log(e3/e2) ;
```

$$p := 2.690488318$$

$$p := 1.942829705$$

$$p := 1.994416800 \quad (8)$$

Metodo delle secanti

```
> S := (x0,x1) -> x1-f(x1)/((f(x1)-f(x0))/(x1-x0)) ;
```

$$S := (x0, x1) \rightarrow x1 - \frac{f(x1)\ (x1 - x0)}{f(x1) - f(x0)} \quad (9)$$

```
> x0 := 0.7 ;
  x1 := 0.8 ;
  x2 := evalf(S(x0,x1),50) ;
  x3 := evalf(S(x1,x2),50) ;
  x4 := evalf(S(x2,x3),50) ;
  x5 := evalf(S(x3,x4),50) ;
  x6 := evalf(S(x4,x5),50) ;
  x7 := evalf(S(x5,x6),50) ;
```

$$x0 := 0.7$$

$$x1 := 0.8$$

$$x2 := 1.1547948641593471825196571674807547367955221021601$$

$x3 := 0.95285439506980220233891962556357625181031817044289$

$x4 := 0.99001977108895385962662286145242496003862309831430$

$x5 := 1.0007409050250092826205058965275256196581697080894$

$x6 := 0.99998882255618958216758906876047598161680542096957$

$x7 := 0.99999998758541413525252308926380178255759105774435$ **(10)**

```
> e0 := abs(x0-alpha) ;
  e1 := abs(x1-alpha) ;
  e2 := abs(x2-alpha) ;
  e3 := abs(x3-alpha) ;
  e4 := abs(x4-alpha) ;
  e5 := abs(x5-alpha) ;
  e6 := abs(x6-alpha) ;
  e7 := abs(x7-alpha) ;
```

$e0 := 0.3$

$e1 := 0.2$

$e2 := 0.154794864$

$e3 := 0.0471456049$

$e4 := 0.0099802289$

$e5 := 0.000740905$

$e6 := 0.0000111774$

$e7 := 1.24\ 10^{-8}$ **(11)**

```
> p := log(e2/e1)/log(e1/e0) ;
  p := log(e3/e2)/log(e2/e1) ;
  p := log(e4/e3)/log(e3/e2) ;
  p := log(e5/e4)/log(e4/e3) ;
  p := log(e6/e5)/log(e5/e4) ;
  p := log(e7/e6)/log(e6/e5) ;
```

$p := 0.6319078487$

$p := 4.640058709$

$p := 1.305986215$

$p := 1.674887717$

$p := 1.612765407$

$p := 1.622314621$ **(12)**