Opgave 1.1.5

Opgave 1.1.5a

> **Deriving the Taylor series at 0 for the function** $f(x) = \ln(x+1)$

> $f := x \to \ln(x+1)$

$$f := x \to \ln(x+1) \tag{1.1.1}$$

> $f'(x)$

$$\frac{1}{x+1} \tag{1.1.2}$$

> $f''(x)$

$$-\frac{1}{(x+1)^2} \tag{1.1.3}$$

> $\ln(x+1) = \sum_{k=0}^{\infty} \frac{1}{k!} f^{(k)}(0)\,(x-0)^k + E_n(x)$

> **I taylor series er** $f(x)$

$$= \ln(x+1) + \frac{1}{x+1}(x-0) - \frac{2}{2(x+1)^2}(x-0)^2 + \ldots + \frac{(-1)^{k-1}}{k!\,(x+1)^k}(x+0)^k$$

> $taylor(f(x), x, 10)$

$$x - \frac{1}{2}x^2 + \frac{1}{3}x^3 - \frac{1}{4}x^4 + \frac{1}{5}x^5 - \frac{1}{6}x^6 + \frac{1}{7}x^7 - \frac{1}{8}x^8 + \frac{1}{9}x^9 + \mathrm{O}(x^{10}) \tag{1.1.4}$$

> $f(0.5)$

$$0.4054651081 \tag{1.1.5}$$

> $f(x) = \sum_{k=1}^{\infty} \frac{(-1)^{k-1}}{k} x^k$

$$\ln(x+1) = \ln(x+1) \tag{1.1.6}$$

> **k starter fra 1 fordi summeringen har k alene under brøkstregen. Vi kan se at maple også udregner summeringen til at være** $\ln(x+1)$**.**

> $E_n(x) = \frac{1}{(n+1)!} f^{(n+1)}(\xi)\,(x-c)^{n+1}$

$$E_n(x) = \frac{\mathrm{D}^{(n+1)}(f)\,(\xi)\,(x-c)^{n+1}}{(n+1)!} \tag{1.1.7}$$

> **Vi truncater vores serie til hhv 3 og 4 termer og giver herunder 2 udtryk for resten.**

> $E_3(x) = \frac{1}{(3+1)!}\left(-\frac{6}{(x+1)^4}\right)(\xi)x^4$

$$E_3(x) = -\frac{1}{4}\,\frac{x^4}{(x(\xi)+1)^4} \tag{1.1.8}$$

> $E_4(x) = \frac{1}{(4+1)!}\left(\frac{24}{(x+1)^5}\right)(\xi)x^5$

$$E_4(x) = \frac{1}{5}\,\frac{x^5}{(x(\xi)+1)^5} \tag{1.1.9}$$

Opgave 1.1.5b

> Vi skal forsøge at finde $\ln(1.5)$ ved hjælp af en taylor serie. Vores fejl margen skal være mindre end 10^{-8}.

> Vi ved at usikkerheden er opadtil begrænset af den sidste term i udviklingen. Samtidig gør $(-1)^{n-1}$ ingen forskel for størrelsen af fejl. Derfor har vi:

> $E := solve\left(\frac{0.5^n}{n} \leq 10^{-8}, n\right);$

$$E := RealRange(-\infty, Open(0.)), RealRange(Open(22.10887129), \infty) \tag{1.2.1}$$

> $\frac{0.5^{22}}{22}$

$$1.083720814\ 10^{-8} \tag{1.2.2}$$

> $\frac{0.5^{23}}{23}$

$$5.183012591\ 10^{-9} \tag{1.2.3}$$

> Her ser vi at der skal minimum 23 termer til at få fejlen ned på mindre end 10^{-8}.

Opgave 1.1.5c

> For at finde det mindste antal termer for $\ln(1.6)$ til en præcision på 10^{-10} tager vi altså:

> $E := solve\left(\frac{0.6^n}{n} \leq 10^{-10}, n\right)$

$$E := RealRange(-\infty, Open(0.)), RealRange(37.95697913, \infty) \tag{1.3.1}$$

> Her skal der bruges 38 termer for at få den ønskede præcision.

Opgave 1.1.34

> "Determine a function that can be termed the linearization of $x^3 - 2x$ at 2. "

> Man kan udregne linearization af en funktion ved at se på taylor ekapansionens første termer:

> $f := x \to x^3 - 2x$

$$f := x \to x^3 - 2x \tag{2.1}$$

> $taylor(f(x), x = 2, 2)$

$$4 + 10(x-2) + O((x-2)^2) \tag{2.2}$$

> Derfor er linearization af:

> $\{f(x), x = 2\} = 4 + 10(x-2)$

Opgave JH-1

1

> trunc(2.6)

$$2 \tag{3.1.1}$$

> trunc(-2.4)

$$-2 \tag{3.1.2}$$

> round(2.6)

$$3 \tag{3.1.3}$$

> round(-2.4)

$$-2 \tag{3.1.4}$$

> floor(2.6)

$$2 \tag{3.1.5}$$

> floor(-2.4)

$$-3 \tag{3.1.6}$$

> ceil(2.6)

$$3 \tag{3.1.7}$$

> ceil(-2.4)

$$-2 \tag{3.1.8}$$

> round(2.5)

$$3 \tag{3.1.9}$$

> round(-2.5)

$$-3 \tag{3.1.10}$$

2

> $\mathrm{trunc}(x) = \mathrm{floor}(x)$ **for** $x > 0$

> $\mathrm{trunc}(x) = \mathrm{ceil}(x)$ **for** $x < 0$

3

> $\mathrm{trunc}(x)$ *runder x ned til nærmeste heltal* **for** $x > 0$ *og runder x op til nærmeste heltal* **for** $x < 0$.
$\mathrm{round}(x)$ *runder x til nærmeste heltal* **for** *alle x*.
$\mathrm{floor}(x)$ *runder x ned til nærmeste heltal* **for** *alle x*
$\mathrm{ceil}(x)$ *runder x op til nærmeste heltal* **for** *alle x*

Opgave CP 1.2.1

> $$formula(x, n, c) := \begin{cases} x_0 = 1 & x_1 = c \\ x_{n+1} = x_n + x_{n-1} & n \geq 1 \end{cases}$$

$$formula := (x, n, c) \rightarrow piecewise\left(x_1 = c, x_0 = 1, 1 \leq n, x_{1+n} = x_n + x_{n-1}\right) \tag{4.1}$$

a

> $c := \frac{(1+\sqrt{5})}{2}$; $x_0 := 1$; $x_1 := c$;
for n **from** 1 **to** 29 **do**
$x_{n+1} := x_n + x_{n-1}$;
end do

$$c := \frac{1}{2} + \frac{1}{2}\sqrt{5}$$
$$x_0 := 1$$
$$x_1 := \frac{1}{2} + \frac{1}{2}\sqrt{5}$$
$$x_2 := \frac{3}{2} + \frac{1}{2}\sqrt{5}$$
$$x_3 := 2 + \sqrt{5}$$
$$x_4 := \frac{7}{2} + \frac{3}{2}\sqrt{5}$$
$$x_5 := \frac{11}{2} + \frac{5}{2}\sqrt{5}$$
$$x_6 := 9 + 4\sqrt{5}$$
$$x_7 := \frac{29}{2} + \frac{13}{2}\sqrt{5}$$
$$x_8 := \frac{47}{2} + \frac{21}{2}\sqrt{5}$$
$$x_9 := 38 + 17\sqrt{5}$$
$$x_{10} := \frac{123}{2} + \frac{55}{2}\sqrt{5}$$
$$x_{11} := \frac{199}{2} + \frac{89}{2}\sqrt{5}$$
$$x_{12} := 161 + 72\sqrt{5}$$
$$x_{13} := \frac{521}{2} + \frac{233}{2}\sqrt{5}$$
$$x_{14} := \frac{843}{2} + \frac{377}{2}\sqrt{5}$$
$$x_{15} := 682 + 305\sqrt{5}$$
$$x_{16} := \frac{2207}{2} + \frac{987}{2}\sqrt{5}$$
$$x_{17} := \frac{3571}{2} + \frac{1597}{2}\sqrt{5}$$
$$x_{18} := 2889 + 1292\sqrt{5}$$
$$x_{19} := \frac{9349}{2} + \frac{4181}{2}\sqrt{5}$$

$$x_{20} := \frac{15127}{2} + \frac{6765}{2}\sqrt{5}$$

$$x_{21} := 12238 + 5473\sqrt{5}$$

$$x_{22} := \frac{39603}{2} + \frac{17711}{2}\sqrt{5}$$

$$x_{23} := \frac{64079}{2} + \frac{28657}{2}\sqrt{5}$$

$$x_{24} := 51841 + 23184\sqrt{5}$$

$$x_{25} := \frac{167761}{2} + \frac{75025}{2}\sqrt{5}$$

$$x_{26} := \frac{271443}{2} + \frac{121393}{2}\sqrt{5}$$

$$x_{27} := 219602 + 98209\sqrt{5}$$

$$x_{28} := \frac{710647}{2} + \frac{317811}{2}\sqrt{5}$$

$$x_{29} := \frac{1149851}{2} + \frac{514229}{2}\sqrt{5}$$

$$x_{30} := 930249 + 416020\sqrt{5} \tag{4.1.1}$$

> **for** n **from** 1 **to** 30 **do** $x_n := \left(\frac{1+\sqrt{5}}{2}\right)^n$; **end do**

$$x_1 := \frac{1}{2} + \frac{1}{2}\sqrt{5}$$

$$x_2 := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^2$$

$$x_3 := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^3$$

$$x_4 := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^4$$

$$x_5 := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^5$$

$$x_6 := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^6$$

$$x_7 := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^7$$

$$x_8 := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^8$$

$$x_9 := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^9$$

$$x_{10} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{10}$$
$$x_{11} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{11}$$
$$x_{12} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{12}$$
$$x_{13} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{13}$$
$$x_{14} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{14}$$
$$x_{15} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{15}$$
$$x_{16} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{16}$$
$$x_{17} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{17}$$
$$x_{18} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{18}$$
$$x_{19} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{19}$$
$$x_{20} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{20}$$
$$x_{21} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{21}$$
$$x_{22} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{22}$$
$$x_{23} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{23}$$
$$x_{24} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{24}$$
$$x_{25} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{25}$$
$$x_{26} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{26}$$
$$x_{27} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{27}$$
$$x_{28} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{28}$$
$$x_{29} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{29}$$

$$x_{30} := \left(\frac{1}{2} + \frac{1}{2}\sqrt{5}\right)^{30} \tag{4.1.2}$$

b

> $c := \frac{(1-\sqrt{5})}{2}$; $x_0 := 1$; $x_1 := c$;
> **for** n **from** 1 **to** 29 **do**
> $x_{n+1} := x_n + x_{n-1}$;
> **end do**

$$c := \frac{1}{2} - \frac{1}{2}\sqrt{5}$$

$$x_0 := 1$$

$$x_1 := \frac{1}{2} - \frac{1}{2}\sqrt{5}$$

$$x_2 := \frac{3}{2} - \frac{1}{2}\sqrt{5}$$

$$x_3 := 2 - \sqrt{5}$$

$$x_4 := \frac{7}{2} - \frac{3}{2}\sqrt{5}$$

$$x_5 := \frac{11}{2} - \frac{5}{2}\sqrt{5}$$

$$x_6 := 9 - 4\sqrt{5}$$

$$x_7 := \frac{29}{2} - \frac{13}{2}\sqrt{5}$$

$$x_8 := \frac{47}{2} - \frac{21}{2}\sqrt{5}$$

$$x_9 := 38 - 17\sqrt{5}$$

$$x_{10} := \frac{123}{2} - \frac{55}{2}\sqrt{5}$$

$$x_{11} := \frac{199}{2} - \frac{89}{2}\sqrt{5}$$

$$x_{12} := 161 - 72\sqrt{5}$$

$$x_{13} := \frac{521}{2} - \frac{233}{2}\sqrt{5}$$

$$x_{14} := \frac{843}{2} - \frac{377}{2}\sqrt{5}$$

$$x_{15} := 682 - 305\sqrt{5}$$

$$x_{16} := \frac{2207}{2} - \frac{987}{2}\sqrt{5}$$

$$x_{17} := \frac{3571}{2} - \frac{1597}{2}\sqrt{5}$$

$$x_{18} := 2889 - 1292\sqrt{5}$$

$$x_{19} := \frac{9349}{2} - \frac{4181}{2}\sqrt{5}$$

$$x_{20} := \frac{15127}{2} - \frac{6765}{2}\sqrt{5}$$

$$x_{21} := 12238 - 5473\sqrt{5}$$

$$x_{22} := \frac{39603}{2} - \frac{17711}{2}\sqrt{5}$$

$$x_{23} := \frac{64079}{2} - \frac{28657}{2}\sqrt{5}$$

$$x_{24} := 51841 - 23184\sqrt{5}$$

$$x_{25} := \frac{167761}{2} - \frac{75025}{2}\sqrt{5}$$

$$x_{26} := \frac{271443}{2} - \frac{121393}{2}\sqrt{5}$$

$$x_{27} := 219602 - 98209\sqrt{5}$$

$$x_{28} := \frac{710647}{2} - \frac{317811}{2}\sqrt{5}$$

$$x_{29} := \frac{1149851}{2} - \frac{514229}{2}\sqrt{5}$$

$$x_{30} := 930249 - 416020\sqrt{5} \qquad \textbf{(4.2.1)}$$

> **for** n **from** 1 **to** 30 **do** $x_n := \left(\frac{1-\sqrt{5}}{2}\right)^n$ **;end do**

$$x_1 := \frac{1}{2} - \frac{1}{2}\sqrt{5}$$

$$x_2 := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^2$$

$$x_3 := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^3$$

$$x_4 := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^4$$

$$x_5 := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^5$$

$$x_6 := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^6$$

$$x_7 := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^7$$

$$x_8 := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^8$$

$$x_9 := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^9$$

$$x_{10} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{10}$$

$$x_{11} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{11}$$

$$x_{12} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{12}$$

$$x_{13} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{13}$$

$$x_{14} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{14}$$

$$x_{15} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{15}$$

$$x_{16} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{16}$$

$$x_{17} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{17}$$

$$x_{18} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{18}$$

$$x_{19} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{19}$$

$$x_{20} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{20}$$

$$x_{21} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{21}$$

$$x_{22} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{22}$$

$$x_{23} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{23}$$

$$x_{24} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{24}$$

$$x_{25} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{25}$$

$$x_{26} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{26}$$

$$x_{27} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{27}$$

$$x_{28} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{28}$$

$$x_{29} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{29}$$

$$x_{30} := \left(\frac{1}{2} - \frac{1}{2}\sqrt{5}\right)^{30} \tag{4.2.2}$$

c

```
> c := 1; x[0] := 1; x[1] := c;
  for n from 1 to 29 do
  x[n+1] := x[n] + x[n-1];
  end do
```

$$c := 1$$
$$x_0 := 1$$
$$x_1 := 1$$
$$x_2 := 2$$
$$x_3 := 3$$
$$x_4 := 5$$
$$x_5 := 8$$
$$x_6 := 13$$
$$x_7 := 21$$
$$x_8 := 34$$
$$x_9 := 55$$
$$x_{10} := 89$$
$$x_{11} := 144$$
$$x_{12} := 233$$
$$x_{13} := 377$$
$$x_{14} := 610$$
$$x_{15} := 987$$
$$x_{16} := 1597$$
$$x_{17} := 2584$$
$$x_{18} := 4181$$
$$x_{19} := 6765$$
$$x_{20} := 10946$$
$$x_{21} := 17711$$
$$x_{22} := 28657$$

$$x_{23} := 46368$$
$$x_{24} := 75025$$
$$x_{25} := 121393$$
$$x_{26} := 196418$$
$$x_{27} := 317811$$
$$x_{28} := 514229$$
$$x_{29} := 832040$$
$$x_{30} := 1346269 \tag{4.3.1}$$

> **for** n **from** 1 **to** 30 **do** $x_n := evalf\left(\frac{1}{\mathrm{sqrt}(5)}\left(\frac{(1+\mathrm{sqrt}(5))}{2}\right)^{n+1} - \frac{1}{\mathrm{sqrt}(5)} \cdot \left(\left(\frac{1-\mathrm{sqrt}(5)}{2}\right)^{n+1}\right)\right)$; **end do**

$$x_1 := 0.9999999992$$
$$x_2 := 1.999999997$$
$$x_3 := 2.999999994$$
$$x_4 := 4.999999988$$
$$x_5 := 7.999999977$$
$$x_6 := 12.99999996$$
$$x_7 := 20.99999993$$
$$x_8 := 33.99999985$$
$$x_9 := 54.99999974$$
$$x_{10} := 88.99999953$$
$$x_{11} := 143.9999991$$
$$x_{12} := 232.9999986$$
$$x_{13} := 376.9999975$$
$$x_{14} := 609.9999959$$
$$x_{15} := 986.9999928$$
$$x_{16} := 1596.999987$$
$$x_{17} := 2583.999979$$
$$x_{18} := 4180.999962$$
$$x_{19} := 6764.999934$$
$$x_{20} := 10945.99989$$
$$x_{21} := 17710.99982$$
$$x_{22} := 28656.99969$$
$$x_{23} := 46367.99946$$

$$x_{24} := 75024.99912$$
$$x_{25} := 1.213929985\ 10^5$$
$$x_{26} := 1.964179975\ 10^5$$
$$x_{27} := 3.178109958\ 10^5$$
$$x_{28} := 5.142289932\ 10^5$$
$$x_{29} := 8.320399882\ 10^5$$
$$x_{30} := 1.346268980\ 10^6 \quad \textbf{(4.3.2)}$$

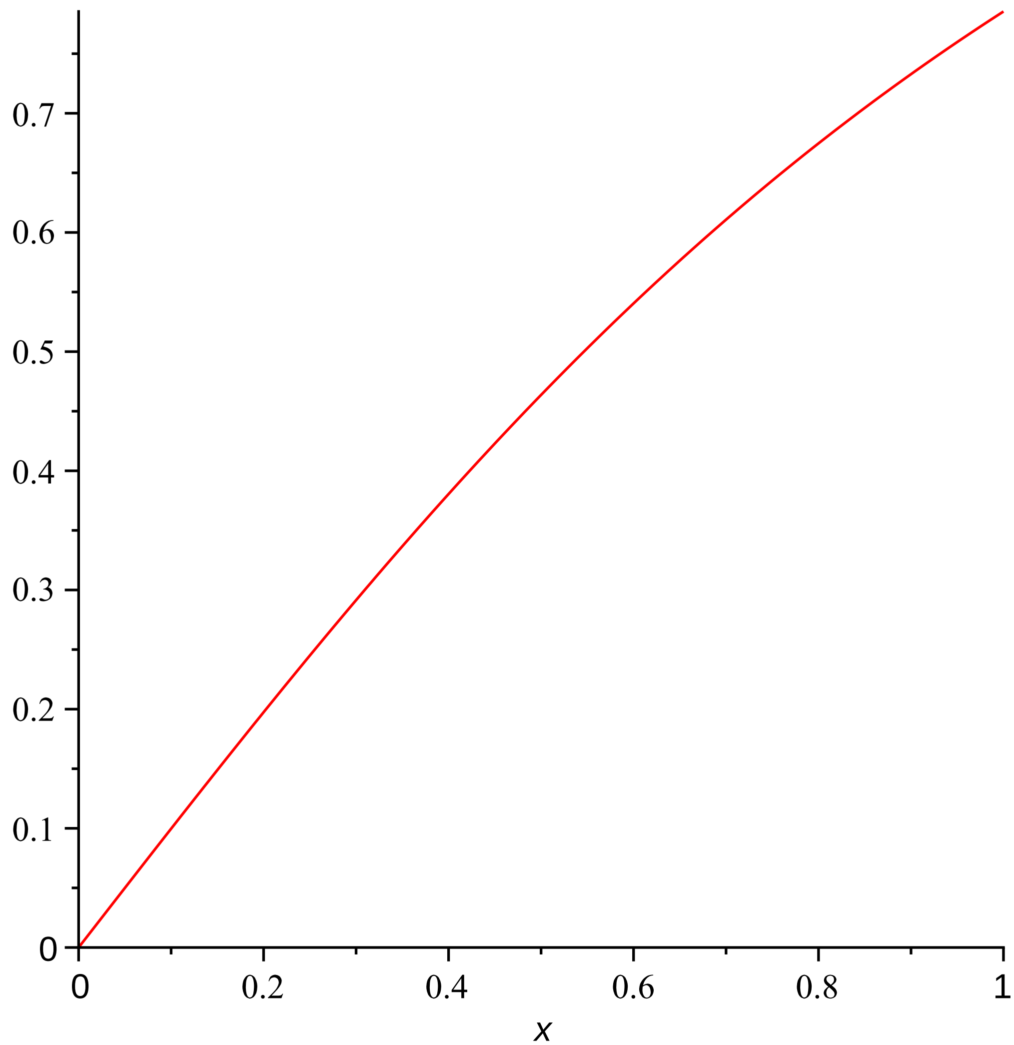
> **For hvert sæt af resultater med samme c-værdi giver x_n i realiteten samme værdi. Men grundet approximationer i udregningerne bliver de endelige resultater fra maple lidt forskellige. Dette ses tydligst hvor $c = 1$ hvor fejlen bliver mere tydelig, jo længere vi kommer i fibbonachi sekvensen.**

Opgave 1.2.1

> **Vi troede dette var problem 1.2.1 indtil vi opdagede at der fandtes "computer problems"**

> **"Determine the best integer value of k in the equation**
> $\arctan(x) = x + Oh(x^k)$ **as** $x \to 0$**"**

> $plot(\arctan(x), x = 0..1)$



> $taylor(\arctan(x), x, 7)$

$$x - \frac{1}{3}x^3 + \frac{1}{5}x^5 + O(x^7) \quad \textbf{(5.1)}$$

> $taylor(\arctan(x), x, 1)$

$$O(x) \quad \textbf{(5.2)}$$

> **Som vi kan se, ligner taylorudviklingen af arctan(x) den funktion vi bliver bedt om at udregne den bedste k værdi for. Men ud fra vores plot ses det let, at x bliver tæt på lineær tæt på 0. Dette passer også med den første udvikling af vores taylorudvikling. For at finde den bedste k-værdi når $x \to 0$ skal $x^k \to 0$ for at $x + x^k \to \arctan(x)$.**

> **Der findes ikke en enkelt bedste k-værdi, men for $1 \le x$ skal $k = 0$.**

> **For $0 \le x < 1$ skal $k \to \infty$ for at x^k har mindst mulig indflydelse.**

Opgave JH-2

> $with(linalg)$:

> $with(LinearAlgebra)$:

```
> fib := proc(val :: integer, num :: integer) :: Array;
     local Values, c, n;
     Values := Array(0..(num + 1));
     c := val; Values[0] := 1; Values[1] := c;
     for n from 1 to num do
     Values[n + 1] := Values[n] + Values[n − 1];
     end do;
     return Values;
  end proc;
```

$fib := \mathbf{proc}(val::integer, num::integer)::Array;$ **(6.1)**

  local $Values, c, n;$

  $Values := Array(0..num + 1);$

  $c := val;$

  $Values[0] := 1;$

  $Values[1] := c;$

  for n **to** num **do** $Values[n + 1] := Values[n] + Values[n - 1]$ **end do**;

  return $Values$

end proc

```
> N := 10;
```

$$N := 10 \tag{6.2}$$

```
> X := Matrix(1, N)
```

$$X := \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \tag{6.3}$$

```
> temp := fib(0, N)
```

$$temp := \begin{bmatrix} \text{0 .. 11 Array} \\ \text{Data Type: anything} \\ \text{Storage: rectangular} \\ \text{Order: Fortran\_order} \end{bmatrix} \tag{6.4}$$

```
> for n from 2 to N + 1 do X[1][n − 1] := temp[n]; end do
```

$$(X_1)_1 := 1$$

$$(X_1)_2 := 1$$

$$(X_1)_3 := 2$$

$$(X_1)_4 := 3$$

$$(X_1)_5 := 5$$

$$(X_1)_6 := 8$$

$$(X_1)_7 := 13$$

$$(X_1)_8 := 21$$

$$(X_1)_9 := 34$$

(6.5)

$$\left(X_1\right)_{10} := 55 \qquad \textbf{(6.5)}$$

> X

$$\left[\begin{array}{cccccccccc} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{array}\right] \qquad \textbf{(6.6)}$$

> $0\$(4)$

$$0, 0, 0, 0 \qquad \textbf{(6.7)}$$

> $B := Vector(N)$

$$B := \left[\begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{array}\right] \qquad \textbf{(6.8)}$$

> $A := Matrix(N, shape = identity)$

$$A := \left[\begin{array}{cccccccccc} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{array}\right] \qquad \textbf{(6.9)}$$

> $Transpose(X)$

(6.10)

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \quad \textbf{(6.10)}$$

> X

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad \textbf{(6.11)}$$

> $B := Multiply(A, Transpose(X))$

$$B := \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \quad \textbf{(6.12)}$$

> $LinearAlgebra[LinearSolve](A, B)$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \quad \textbf{(6.13)}$$

Opgave 1.2.4

a

> *restart*;

Vi har at:

> $$\exp(\tan x) = 1 + x + \frac{x^2}{2!} + \frac{3\,x^3}{3!} + \frac{9\,x^4}{4!} + .. + \frac{(n-2)\cdot 3\,x^n}{n!}$$

>