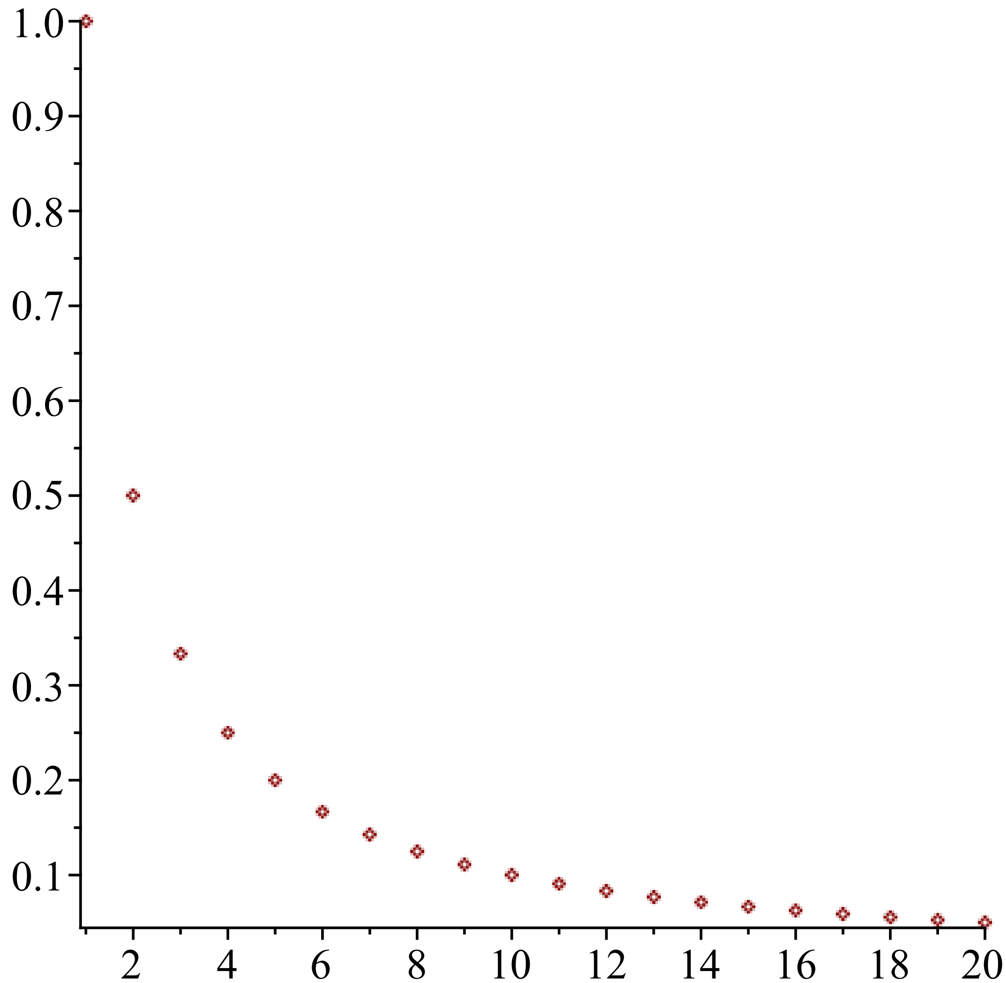
> # test

> # 1.

> $f1 := \frac{1}{n(n+2)}$

$$f1 := \frac{1}{n(n+2)} \quad (1)$$

> $plot(\{seq([n, f1], n = 1..20)\}, style = point)$

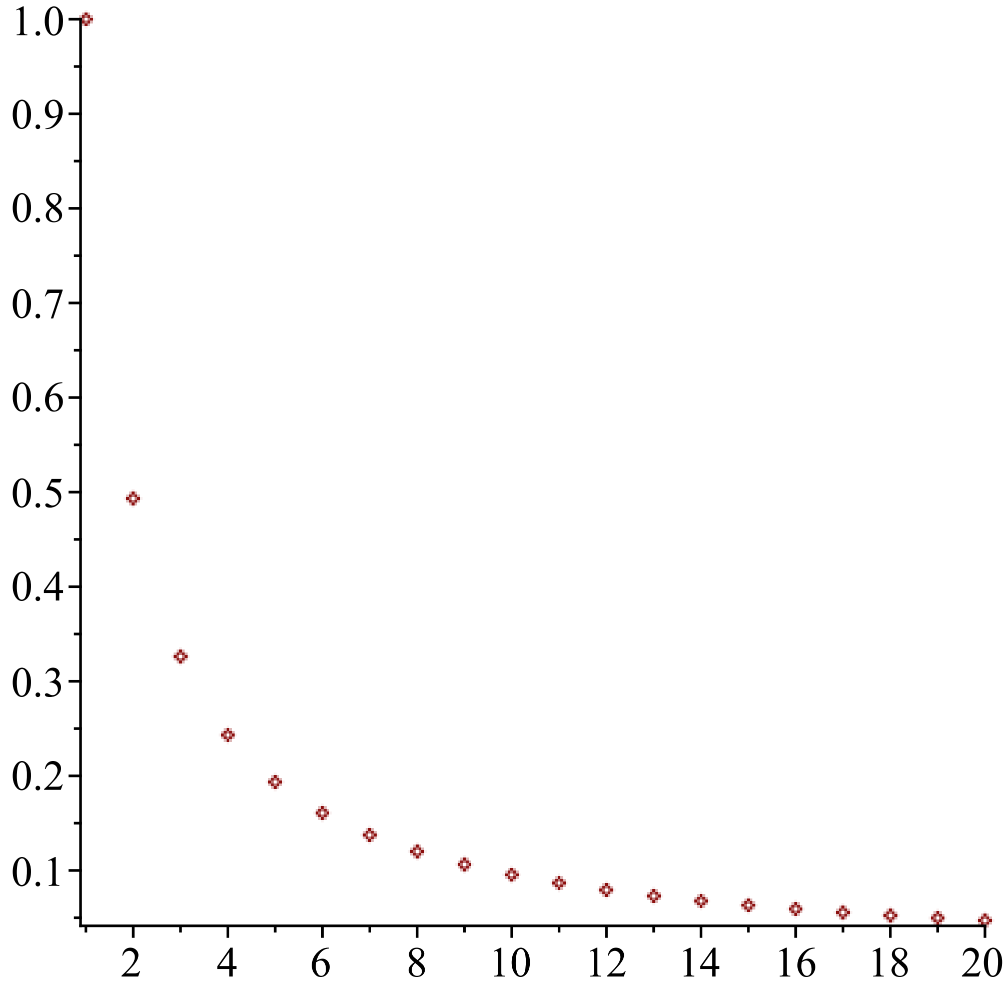


> # 2.

> $f2 := n \rightarrow \frac{1}{n^{\frac{102}{100}}}$

$$f2 := n \mapsto \frac{1}{n^{51/50}} \quad (2)$$

> $plot(\{seq([n, f2(n)], n = 1..20)\}, style = point)$



(3)

> $Sn := m \rightarrow evalf(sum(f2(n), n = 1..m))$

$$Sn := m \mapsto evalf\left(\sum_{n=1}^{m} f2(n)\right) \quad (4)$$

> $sum2 := Sn(\infty)$

$$sum2 := 50.57867004 \quad (5)$$

> $sum2\_100 := Sn(100)$

$$sum2\_100 := 4.982680377 \quad (6)$$

(7)

> $sum2 - sum2\_100$

$$45.59598966 \quad (8)$$

> # 3

> $f3 := \frac{(-1)^{n-1}}{3 \cdot n + 1}$

(9)

$$f3 := \frac{(-1)^{n-1}}{3\,n+1} \tag{9}$$

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> plot({seq([n, |f3|], n = 1 ..10)}, style = point)
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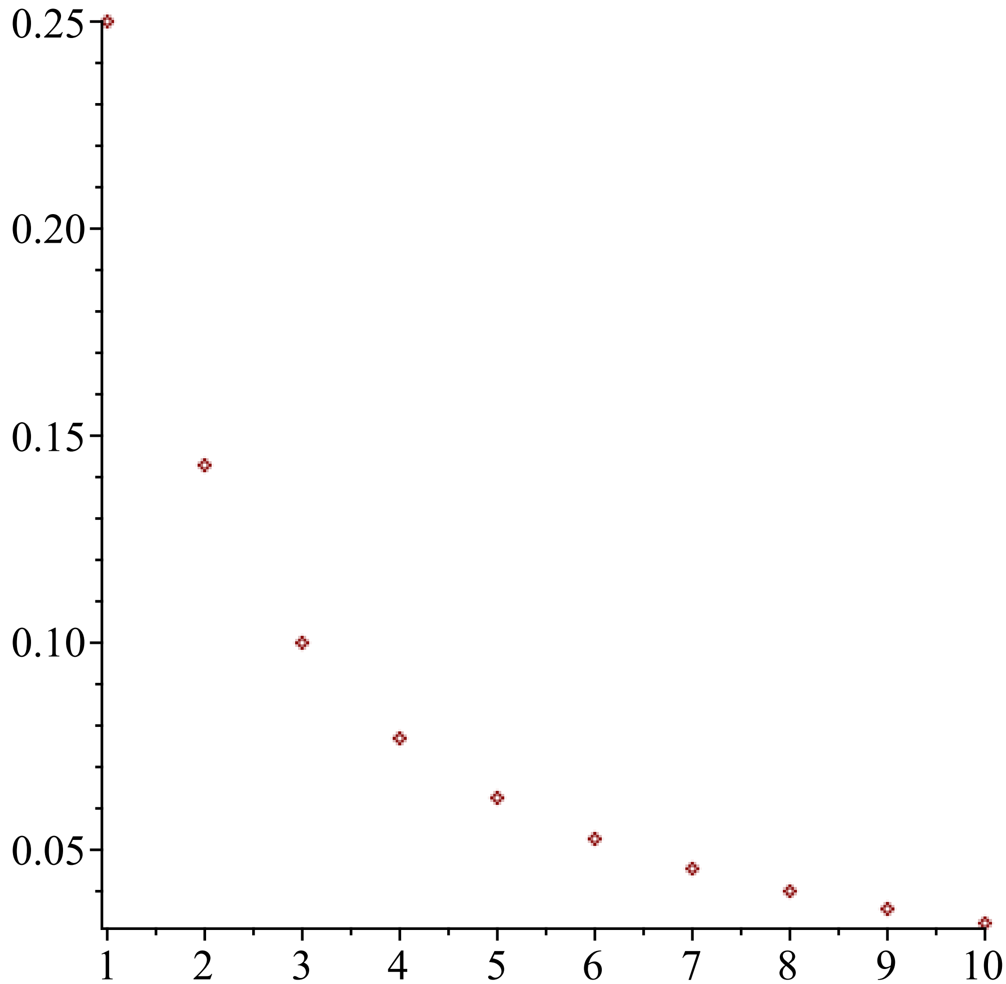

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> limit(|f3|, n = infinity) # признак Лейбница члены ряда убывают по модулю
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$$0 \tag{10}$$

$$> isolve\left(\frac{1}{3\cdot n+1} < 0.1\right)$$

$$\{n = -1 - \_NN4\sim\}, \{n = 4 + \_NN3\sim\} \tag{11}$$

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> g1 := plot({seq([n, f3(n)], n = 1 ..10)}, style = point) :
  g2 := plot({0.1}, color = black) :
  g3 := plot({-0.1}, color = black) :
  plots[display]({g1, g2, g3});
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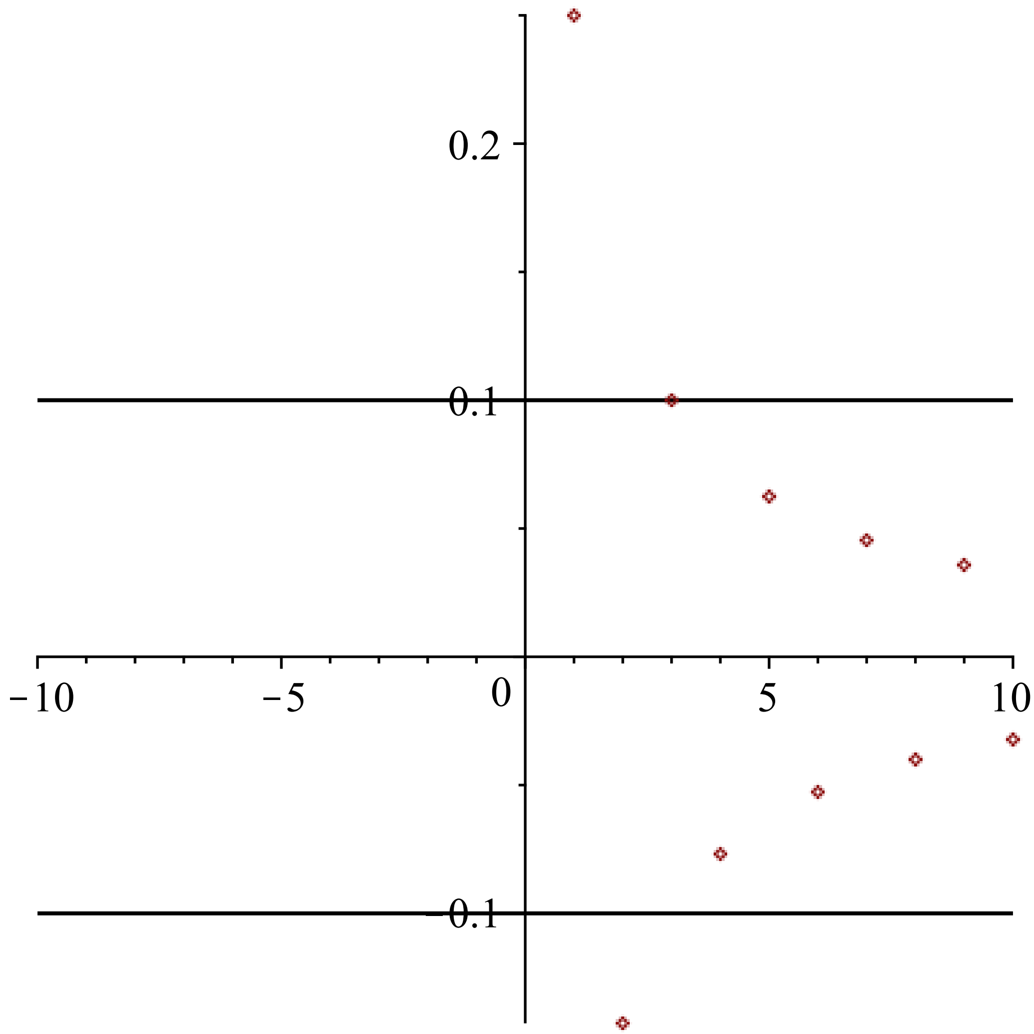


> # 4.

> $f4 := x \rightarrow \frac{6 - 2 \cdot x}{x^2 - 6 \cdot x + 8}$

$$f4 := x \mapsto \frac{6 - 2\,x}{x^2 - 6\,x + 8} \tag{12}$$

> $solve\left(x^2 - 6 \cdot x + 8\right)$

$$4, 2 \tag{13}$$

> $s4 := series(f4(x), x, 4)$

$$s4 := \frac{3}{4} + \frac{5}{16}\,x + \frac{9}{64}\,x^2 + \frac{17}{256}\,x^3 + \mathrm{O}\left(x^4\right) \tag{14}$$

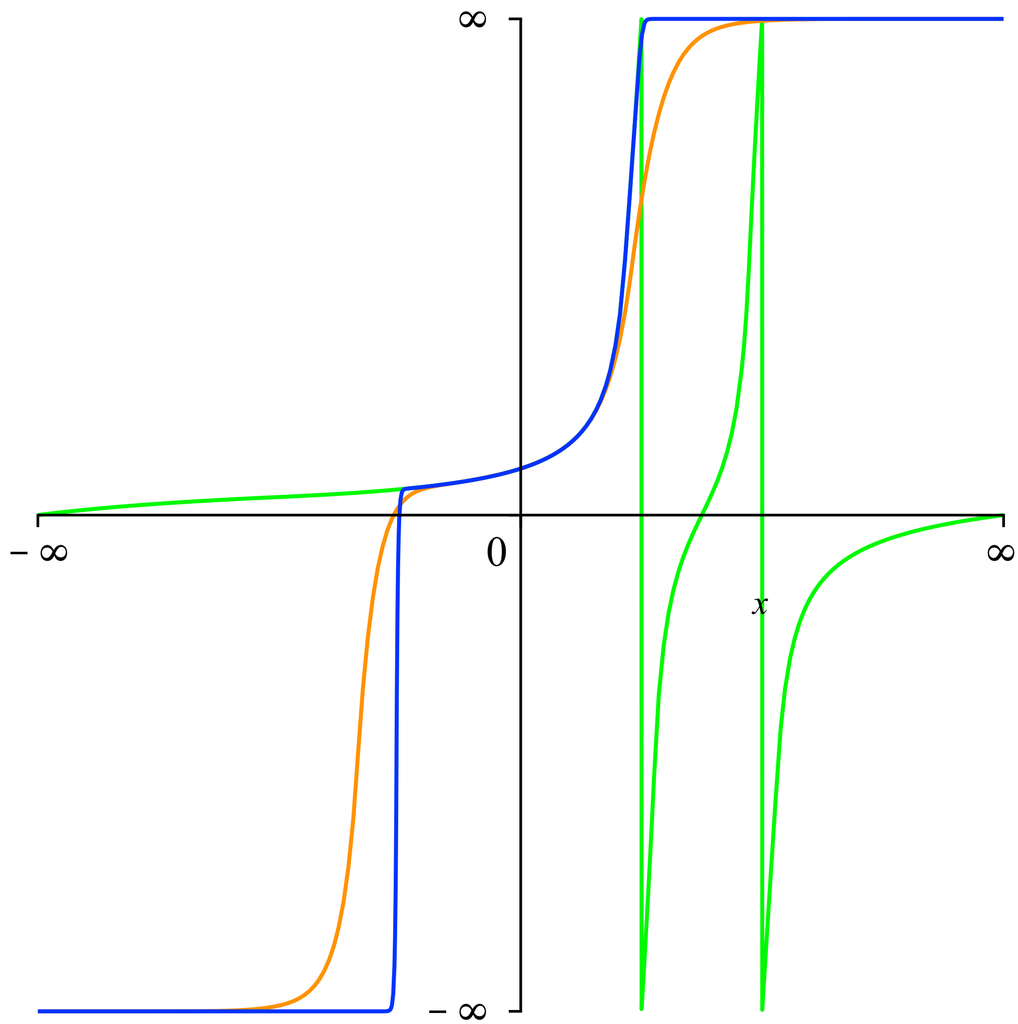
> $p4 := convert(s4, polynom)$

$$p4 := \frac{3}{4} + \frac{5}{16}\,x + \frac{9}{64}\,x^2 + \frac{17}{256}\,x^3 \tag{15}$$

> $g := (x, t) \rightarrow series(f4(x), \mathrm{x}, \mathrm{t})$

$$g := (x, t) \mapsto series(f4(x), x, t) \tag{16}$$

> $plot(\{f4(x), g(x, 10), g(x, 100)\}, x = -\infty..\infty, color = [green, coral, blue, yellow])$



> # 5.

> $f5 := x \rightarrow piecewise(-\mathrm{Pi} < x < 0, 2 \cdot x, 0 \leq x < \mathrm{Pi}, 3)$

$$f5 := x \mapsto \begin{cases} 2x & -\pi < x < 0 \\ 3 & 0 \leq x < \pi \end{cases} \tag{17}$$

> $fouriefunc := \textbf{proc}(f, x, x1, x2, n)$
local a, b, s, l, k;
$l := \dfrac{(x2 - x1)}{2}$;
$a[0] := \dfrac{int(f, x = x1..x2)}{l}$;
$a[k] := \dfrac{int\left(f \cdot \cos\left(\dfrac{k \cdot \mathrm{Pi} \cdot x}{l}\right), x = x1..x2\right)}{l}$;
$b[k] := \dfrac{int\left(f \cdot \sin\left(\dfrac{k \cdot \mathrm{Pi} \cdot x}{l}\right), x = x1..x2\right)}{l}$;

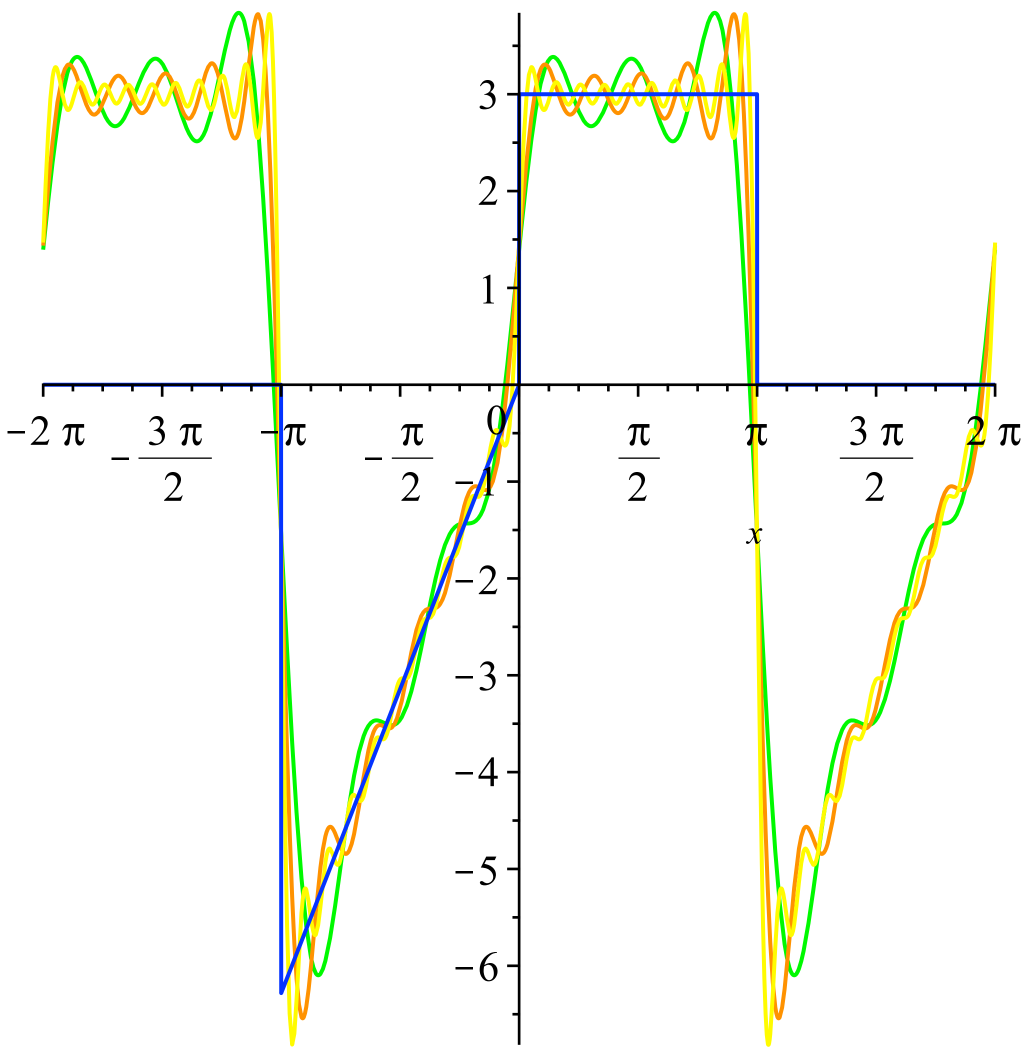
$$s := \frac{a[0]}{2} + sum\left(a[k]\cdot\cos\left(\frac{k\cdot\text{Pi}\cdot x}{l}\right) + b[k]\cdot\sin\left(\frac{k\cdot\text{Pi}\cdot x}{l}\right), k = 1..n\right);$$

end proc:

> $g := (x, t) \rightarrow fouriefunc(f5(x), x, -\text{Pi}, \text{Pi}, \text{t})$

$$g := (x, t) \mapsto fouriefunc(f5(x), x, -\pi, \pi, t) \quad \textbf{(18)}$$

> $plot(\{f5(x), g(x, 5), g(x, 10), g(x, 20)\}, x = -2\cdot\text{Pi}..2\cdot\text{Pi}, color = [green, coral, yellow, blue, red, black])$



> # 6.

> $de := diff(y(x), x) + 4\cdot x^3\cdot y(x) = 4\cdot(x^3 + 1)\cdot\exp(-4x)\cdot(y(x))^2$

$$de := \frac{\mathrm{d}}{\mathrm{d}x}\, y(x) + 4\,x^3\, y(x) = 4\,(x^3 + 1)\,\mathrm{e}^{-4\,x}\, y(x)^2 \quad \textbf{(19)}$$

> $cond := y(0) = 1$

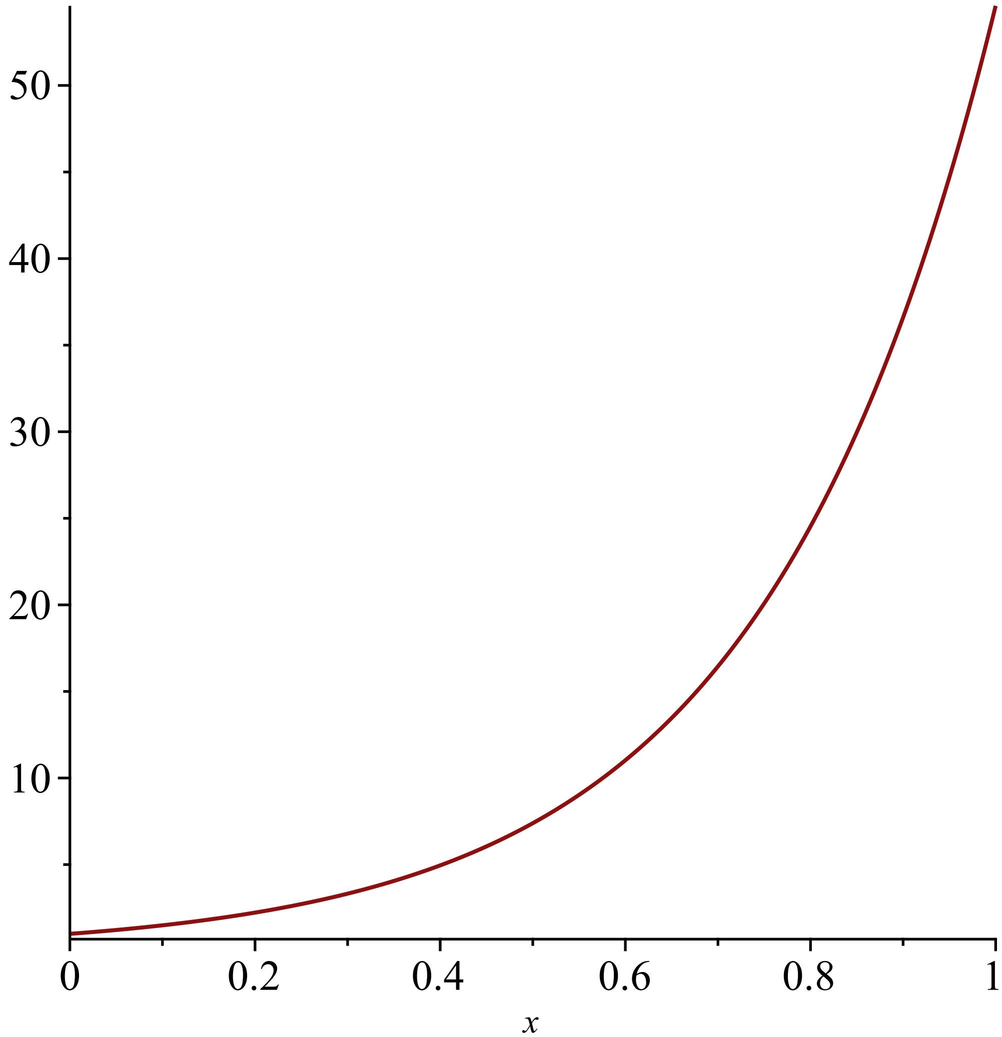
$$cond := y(0) = 1 \quad \textbf{(20)}$$

> $dsolve(\{de, cond\}, y(x))$

$$y(x) = \frac{1}{\mathrm{e}^{-4\,x}} \quad \textbf{(21)}$$

> $sl := rhs(\%):$

> $plot(\{sl\}, x = 0..1)$



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