```
> f:=x^(x^x);
```

$$f := x^{(x^x)}$$

```
> f3:=diff(f,x$3);
```

$$f3 := x^{(x^x)}\left(x^x(\ln(x)+1)\ln(x)+\frac{x^x}{x}\right)^3$$
$$+3\,x^{(x^x)}\left(x^x(\ln(x)+1)\ln(x)+\frac{x^x}{x}\right)\left(x^x(\ln(x)+1)^2\ln(x)+\frac{x^x\ln(x)}{x}+2\,\frac{x^x(\ln(x)+1)}{x}-\frac{x^x}{x^2}\right)+$$
$$x^{(x^x)}\left(x^x(\ln(x)+1)^3\ln(x)+3\,\frac{x^x(\ln(x)+1)\ln(x)}{x}+3\,\frac{x^x(\ln(x)+1)^2}{x}-\frac{x^x\ln(x)}{x^2}+3\,\frac{x^x}{x^2}\right.$$
$$\left.-3\,\frac{x^x(\ln(x)+1)}{x^2}+2\,\frac{x^x}{x^3}\right)$$

```
> subs(x=1,f3);
```

$$((\ln(1)+1)\ln(1)+1)^3+3\,((\ln(1)+1)\ln(1)+1)\,((\ln(1)+1)^2\ln(1)+3\ln(1)+1)$$
$$+(\ln(1)+1)^3\ln(1)+3\,(\ln(1)+1)\ln(1)+3\,(\ln(1)+1)^2-4\ln(1)+2$$

```
> simplify(%);
```

$$9$$

```
> simplify(subs(x=2,f3));
```

$$1024\ln(2)^6+3840\ln(2)^5+6976\ln(2)^4+8128\ln(2)^3+5952\ln(2)^2+2592\ln(2)+528$$

```
> f:=exp(-x^2)*(x^3-x-1);
```

$$f := \mathbf{e}^{(-x^2)}\,(x^3-x-1)$$

```
> f1:=diff(f,x);
```

$$f1 := -2\,x\,\mathbf{e}^{(-x^2)}\,(x^3-x-1)+\mathbf{e}^{(-x^2)}\,(3\,x^2-1)$$

```
> s:=solve(f1,x);
```

$$s := 1+\frac{1}{2}\sqrt{2},\ 1-\frac{1}{2}\sqrt{2},\ \text{-1},\ \text{-1}$$

```
> f2:=diff(f,x$2);
```

$$f2 := -2\,\mathbf{e}^{(-x^2)}\,(x^3-x-1)+4\,x^2\,\mathbf{e}^{(-x^2)}\,(x^3-x-1)-4\,x\,\mathbf{e}^{(-x^2)}\,(3\,x^2-1)+6\,x\,\mathbf{e}^{(-x^2)}$$

```
> subs(x=s[1],f2);
```

$$-2\,\mathbf{e}^{(-(1+1/2\sqrt{2})^2)}\left(\left(1+\frac{1}{2}\sqrt{2}\right)^3-2-\frac{1}{2}\sqrt{2}\right)$$
$$+4\left(1+\frac{1}{2}\sqrt{2}\right)^2\mathbf{e}^{(-(1+1/2\sqrt{2})^2)}\left(\left(1+\frac{1}{2}\sqrt{2}\right)^3-2-\frac{1}{2}\sqrt{2}\right)$$
$$-4\left(1+\frac{1}{2}\sqrt{2}\right)\mathbf{e}^{(-(1+1/2\sqrt{2})^2)}\left(3\left(1+\frac{1}{2}\sqrt{2}\right)^2-1\right)+6\left(1+\frac{1}{2}\sqrt{2}\right)\mathbf{e}^{(-(1+1/2\sqrt{2})^2)}$$

```
> f3:=diff(f,x$3);
```

$$f3 := 12\,x\,\mathbf{e}^{(-x^2)}\,(x^3 - x - 1) - 6\,\mathbf{e}^{(-x^2)}\,(3\,x^2 - 1) - 8\,x^3\,\mathbf{e}^{(-x^2)}\,(x^3 - x - 1) + 12\,x^2\,\mathbf{e}^{(-x^2)}\,(3\,x^2 - 1) - 36\,x^2\,\mathbf{e}^{(-x^2)} + 6\,\mathbf{e}^{(-x^2)}$$

```
> subs(x=s[1],f3);
```

$$-14\,\mathbf{e}^{(-1)}$$

```
> factor(f1);
```

$$-\mathbf{e}^{(-x^2)}\,(2\,x^2 - 4\,x + 1)\,(x + 1)^2$$

```
> simplify(subs(x=s[3],f2));
```

$$-\mathbf{e}^{(-1/4\,(2+\sqrt{2})^2)}\,(8 + 9\,\sqrt{2})$$

```
> simplify(subs(x=s[4],f2));
```

$$\mathbf{e}^{(-1/4\,(-2+\sqrt{2})^2)}\,(-8 + 9\,\sqrt{2})$$

```
> w:=solve(f2=0,x);
```

$$w := -1, \mathrm{RootOf}(2\,\_Z^4 - 2\,\_Z^3 - 7\,\_Z^2 + 5\,\_Z + 1, \mathit{index} = 1),$$
$$\mathrm{RootOf}(2\,\_Z^4 - 2\,\_Z^3 - 7\,\_Z^2 + 5\,\_Z + 1, \mathit{index} = 2),$$
$$\mathrm{RootOf}(2\,\_Z^4 - 2\,\_Z^3 - 7\,\_Z^2 + 5\,\_Z + 1, \mathit{index} = 3),$$
$$\mathrm{RootOf}(2\,\_Z^4 - 2\,\_Z^3 - 7\,\_Z^2 + 5\,\_Z + 1, \mathit{index} = 4)$$

```
> subs(x=w[1],f3);
```

$$-14\,\mathbf{e}^{(-1)}$$

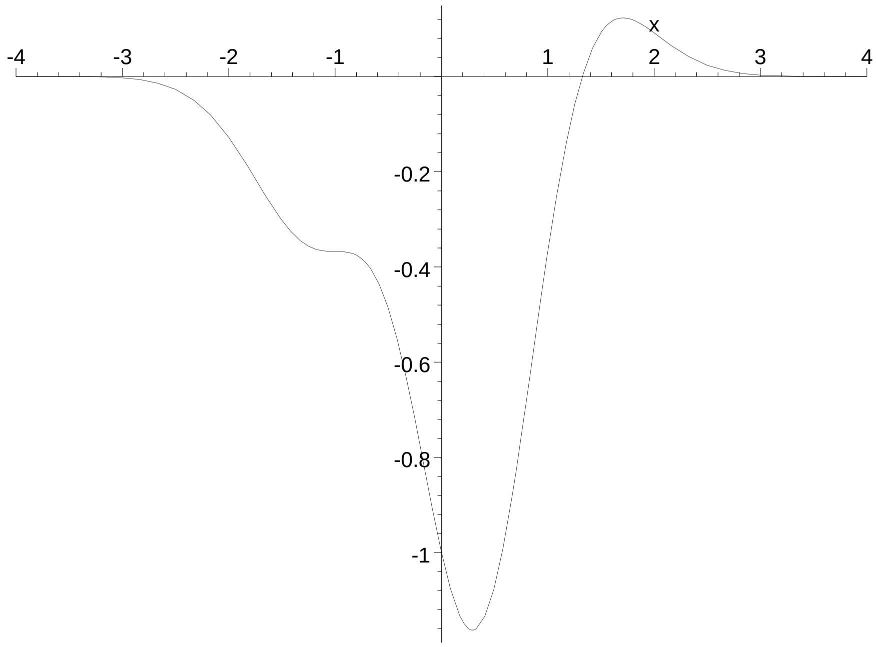
```
> simplify(allvalues(w[2]));
```

```
> evalf(subs(x=%,f3));
```

```
> w0:=evalf(w);
```

$$w0 := -1., .8513060203, 2.053763659, -.1642811851, -1.740788495$$

```
> plot(f,x=-4..4);
```




```
> f:=x->x^2-1;
```

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

```
> (f@@10)(x);
```

$$(((((((((x^2-1)^2-1)^2-1)^2-1)^2-1)^2-1)^2-1)^2-1)^2-1)^2-1$$

```
> subs(x=1/2,diff(%,x));
```

-7614069328839026828861644895183696111800760781901384677463071824057380390842 9\
58018780975005704589254922777766544975436247191506070981403613975405158908406 2\
59118681167809805185963720025069440271641077442296105296344769893665727466023 9\
160633221560208621397413422510037352907885865351655790264539986256120283 / 8\
77779851006990189320949800189953483211902821749173131217920318152991581081547 6\
71546428111925818046978125556054059537879193309418039143664515856594919307247 9\
38319792113601002325694431646709443942642006601977567230655032628625307038446 8\
4136006263299396167241545208153437474241180898298976970388832824328192

```
> F:=n->int(1/(x^n-1),x);   G:=n->int(1/(x^n-1),x=2..3);
```

$$F := n \rightarrow \int \frac{1}{x^n - 1}\, dx$$

$$G := n \to \int_2^3 \frac{1}{x^n - 1}\, dx$$

```
> F(2); G(2);
```

$$-\operatorname{arctanh}(x)$$

$$-\frac{1}{2}\ln(2) + \frac{1}{2}\ln(3)$$

```
> seq(F(n),n=1..3);
```

$$\ln(x-1),\ -\operatorname{arctanh}(x),\ \frac{1}{3}\ln(x-1) - \frac{1}{6}\ln(x^2+x+1) - \frac{1}{3}\sqrt{3}\arctan\left(\frac{1}{3}(2x+1)\sqrt{3}\right)$$

```
> F(3);
```

$$\frac{1}{3}\ln(x-1) - \frac{1}{6}\ln(x^2+x+1) - \frac{1}{3}\sqrt{3}\arctan\left(\frac{1}{3}(2x+1)\sqrt{3}\right)$$

```
> F(4);
```

$$-\frac{1}{2}\operatorname{arctanh}(x) - \frac{1}{2}\arctan(x)$$

```
> F(5);
```

$$\frac{1}{5}\ln(x-1) + \frac{1}{20}\ln(2x^2+x-\sqrt{5}\,x+2)\sqrt{5} - \frac{1}{20}\ln(2x^2+x-\sqrt{5}\,x+2)$$
$$- \frac{\arctan\left(\frac{4x+1-\sqrt{5}}{\sqrt{10+2\sqrt{5}}}\right)}{\sqrt{10+2\sqrt{5}}} - \frac{1}{5}\,\frac{\arctan\left(\frac{4x+1-\sqrt{5}}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{5}}{\sqrt{10+2\sqrt{5}}} - \frac{1}{20}\ln(2x^2+x+\sqrt{5}\,x+2)\sqrt{5}$$
$$- \frac{1}{20}\ln(2x^2+x+\sqrt{5}\,x+2) - \frac{\arctan\left(\frac{4x+1+\sqrt{5}}{\sqrt{10-2\sqrt{5}}}\right)}{\sqrt{10-2\sqrt{5}}} + \frac{\frac{1}{5}\arctan\left(\frac{4x+1+\sqrt{5}}{\sqrt{10-2\sqrt{5}}}\right)\sqrt{5}}{\sqrt{10-2\sqrt{5}}}$$

```
> F(6);
```

$$\frac{1}{6}\ln(x-1) - \frac{1}{12}\ln(x^2+x+1) - \frac{1}{6}\sqrt{3}\arctan\left(\frac{1}{3}(2x+1)\sqrt{3}\right) - \frac{1}{6}\ln(x+1) + \frac{1}{12}\ln(x^2-x+1)$$
$$- \frac{1}{6}\sqrt{3}\arctan\left(\frac{1}{3}(2x-1)\sqrt{3}\right)$$

```
> F(7);
```

$$\frac{1}{7}\ln(x-1) - \frac{1}{7}\left(\sum_{\_R = \mathrm{RootOf}(\_Z^6 - \_Z^5 + \_Z^4 - \_Z^3 + \_Z^2 - \_Z + 1)} \_R\ln(x + \_R)\right)$$

```
> G(7);
```

$$\frac{1}{7}\ln(2)-\frac{1}{7}\left(\sum_{\_R=\mathrm{RootOf}(\_Z^6-\_Z^5+\_Z^4-\_Z^3+\_Z^2-\_Z+1)}\_R\ln(3+\_R)\right)$$
$$+\frac{1}{7}\left(\sum_{\_R=\mathrm{RootOf}(\_Z^6-\_Z^5+\_Z^4-\_Z^3+\_Z^2-\_Z+1)}\_R\ln(2+\_R)\right)$$

```
> evalf(G(7));
```

```
> G(8);
```

$$-\frac{1}{8}\ln(2)-\frac{1}{4}\arctan(3)-\frac{1}{16}\sqrt{2}\ln(3\sqrt{2}+10)+\frac{1}{16}\sqrt{2}\ln(-3\sqrt{2}+10)$$
$$-\frac{1}{8}\sqrt{2}\arctan(3\sqrt{2}+1)-\frac{1}{8}\sqrt{2}\arctan(3\sqrt{2}-1)+\frac{1}{8}\ln(3)+\frac{1}{4}\arctan(2)$$
$$+\frac{1}{16}\sqrt{2}\ln(2\sqrt{2}+5)-\frac{1}{16}\sqrt{2}\ln(-2\sqrt{2}+5)+\frac{1}{8}\sqrt{2}\arctan(2\sqrt{2}+1)$$
$$+\frac{1}{8}\sqrt{2}\arctan(2\sqrt{2}-1)$$

```
> G(9);
```

$$\frac{1}{9}\ln(2)-\frac{1}{18}\ln(13)-\frac{1}{9}\sqrt{3}\arctan\left(\frac{7}{3}\sqrt{3}\right)-\frac{1}{3}\left(\sum_{\_R=\mathrm{RootOf}(729\,\_Z^6-27\,\_Z^3+1)}\_R\ln(3+3\,\_R)\right)$$
$$+\frac{1}{18}\ln(7)+\frac{1}{9}\sqrt{3}\arctan\left(\frac{5}{3}\sqrt{3}\right)+\frac{1}{3}\left(\sum_{\_R=\mathrm{RootOf}(729\,\_Z^6-27\,\_Z^3+1)}\_R\ln(2+3\,\_R)\right)$$

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

```
> G(10);
```

$$\frac{1}{40}\Big(-\sqrt{5}\ln(6-\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}-\sqrt{5}\ln(4-\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}$$
$$+\sqrt{5}\ln(6+\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}+\sqrt{5}\ln(4+\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}$$
$$+4\ln(3)\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}-\ln(4+\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}$$
$$+\ln(6-\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}+\ln(6+\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}$$
$$-\ln(4-\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}-4\arctan\left(\frac{11+\sqrt{5}}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{5}\sqrt{10-2\sqrt{5}}$$
$$-20\arctan\left(\frac{13+\sqrt{5}}{\sqrt{10-2\sqrt{5}}}\right)\sqrt{10+2\sqrt{5}}-20\arctan\left(\frac{13-\sqrt{5}}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{10-2\sqrt{5}}$$

$$+4\arctan\left(\frac{13+\sqrt{5}}{\sqrt{10-2\sqrt{5}}}\right)\sqrt{5}\sqrt{10+2\sqrt{5}}-4\arctan\left(\frac{13-\sqrt{5}}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{5}\sqrt{10-2\sqrt{5}}$$

$$+4\arctan\left(\frac{11-\sqrt{5}}{\sqrt{10-2\sqrt{5}}}\right)\sqrt{5}\sqrt{10+2\sqrt{5}}-20\arctan\left(\frac{11-\sqrt{5}}{\sqrt{10-2\sqrt{5}}}\right)\sqrt{10+2\sqrt{5}}$$

$$-20\arctan\left(\frac{11+\sqrt{5}}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{10-2\sqrt{5}}+20\arctan\left(\frac{\sqrt{5}+9}{\sqrt{10-2\sqrt{5}}}\right)\sqrt{10+2\sqrt{5}}$$

$$+20\arctan\left(\frac{-\sqrt{5}+9}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{10-2\sqrt{5}}+20\arctan\left(\frac{7-\sqrt{5}}{\sqrt{10-2\sqrt{5}}}\right)\sqrt{10+2\sqrt{5}}$$

$$+20\arctan\left(\frac{7+\sqrt{5}}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{10-2\sqrt{5}}-4\arctan\left(\frac{\sqrt{5}+9}{\sqrt{10-2\sqrt{5}}}\right)\sqrt{5}\sqrt{10+2\sqrt{5}}$$

$$+4\arctan\left(\frac{-\sqrt{5}+9}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{5}\sqrt{10-2\sqrt{5}}+4\arctan\left(\frac{7+\sqrt{5}}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{5}\sqrt{10-2\sqrt{5}}$$

$$-4\arctan\left(\frac{7-\sqrt{5}}{\sqrt{10-2\sqrt{5}}}\right)\sqrt{5}\sqrt{10+2\sqrt{5}}-\ln(17+3\sqrt{5})\sqrt{5}\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}$$

$$+\ln(23-3\sqrt{5})\sqrt{5}\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}+\ln(17-3\sqrt{5})\sqrt{5}\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}$$

$$-\ln(23+3\sqrt{5})\sqrt{5}\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}+\ln(17+3\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}$$

$$-\ln(23-3\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}+\ln(17-3\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}$$

$$\left.-4\ln(2)\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}-\ln(23+3\sqrt{5})\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}\right)\Big/\Big($$

$$\sqrt{10-2\sqrt{5}}\sqrt{10+2\sqrt{5}}\Big)$$

```
> f:=(x,y)->(x^y+y^x);
```

```
> (D[1$5,2$3](f))(exp(1),1);
```

$$42\frac{1}{(\mathbf{e})^4}$$

```
> subs({x=exp(1),y=1},diff(f(x,y),x$5,y$3));
```

$$-18\frac{\ln(\mathbf{e})^2}{(\mathbf{e})^4}+10\ln(1)^4+\frac{30\ln(\mathbf{e})}{(\mathbf{e})^4}-60\ln(1)^3+\frac{30}{(\mathbf{e})^4}-3\ln(1)^5(\mathbf{e})^2-30\ln(1)^4\mathbf{e}+2\ln(1)^5\mathbf{e}$$

$$+15\ln(1)^4(\mathbf{e})^2+\ln(1)^5(\mathbf{e})^3+60\ln(1)^2+60\ln(1)^3\mathbf{e}$$

```
> simplify(%);
```

$$42\,\mathbf{e}^{(-4)}$$

[>