lsg02

Aufgabe 1

```
reset()
var('x')
f = (x^2-3*x+5) / (x^3-2*x^2+x); f
```

$$\frac{\left(x^2-3\,x+5\right)}{\left(x^3-2\,x^2+x\right)}$$

```
f.partial_fraction()
```

$$-4\ \frac{1}{(x-1)}+3\ \frac{1}{(x-1)^2}+5\ \frac{1}{x}$$

```
f(x=1)
```

```
Traceback (click to the left of this block for traceback)
...
RuntimeError: power::eval(): division by zero
```

Aufgabe 2

```
reset()
var('x,y')
```

$$(x,y)$$

```
(sin(x)^2 + cos(x)^2).full_simplify()
```

$$1$$

```
sin(x+y).full_simplify()
```

$$\sin(x)\cos(y)+\sin(y)\cos(x)$$

```
cos(x-y).full_simplify()
```

$$\sin(x)\sin(y)+\cos(x)\cos(y)$$

```
(1+tan(x)^2).full_simplify()
```

$$\frac{1}{\cos(x)^2}$$

Aufgabe 3

```
reset()
var('k,n')
```

$$(k,n)$$

```
sum(k, k,1,n)
```

$$\frac{1}{2}\,n^2 + \frac{1}{2}\,n$$

```
sum(2*k-1, k,1,n)
```

$$n^2$$

```
sum(k^2, k,1,n)
```

$$\frac{1}{3}\,n^3 + \frac{1}{2}\,n^2 + \frac{1}{6}\,n$$

```
(sum(k^3, k,1,n) - sum(k, k,1,n)^2).full_simplify()
```

$$0$$

Aufgabe 4

```
reset()
var('a,x')
factor(1458*a*x+2430*a^2-315*a^3+5*a^4-972*x^2+126*a*x^2-189*a^2*x+3*a^3*x-
2*a^2*x^2)
```

$$\left(a - 54\right)\left(a - 9\right)\left(a + x\right)\left(5\,a - 2\,x\right)$$

Aufgabe 5

```
reset()
var('x')
[x^n for n in range(1,10)]
```

$$\left[x, x^2, x^3, x^4, x^5, x^6, x^7, x^8, x^9\right]$$

Aufgabe 6

```
reset()
find_root(x-exp(-x), 0,1)
```

$$0.56714329041$$

Aufgabe 7

```
reset()
```

```
[(x == m) for m in range(1,4)]
```

$$\left[x = 1, x = 2, x = 3\right]$$

```
[(x == m) for m in range(1,4) if is_prime(m)]
```

$$[x = 2, x = 3]$$

Aufgabe 8

```
# Näherung für pi
n = 100000
c = 0
for i in [1..n]:
   x = random()
   y = random()
   if x^2+y^2 <= 1:
      c = c + 1
print 4*(c/n).n()
```

```
3.13896000000000
```

```
seitenlaenge = 300
liste = [0..seitenlaenge]
anzquadrat = len(liste)^2
anzkreis = len([(i,j) for i in liste for j in liste if i^2+j^2 <= seitenlaenge^2])
float(4*anzkreis/anzquadrat)
```

3.13351949758