lsg01

Aufgabe 1

```
f(x) = exp(1/x)+1/4*x*exp(1/x) ; f
```

```
x |--> 1/4*x*e^(1/x) + e^(1/x)
```

```
f.limit(x=0,dir='minus'),f.limit(x=0,dir='plus')
```

```
(x |--> 0, x |--> +Infinity)
```

```
f.limit(x=oo);f.limit(x=-oo)
```

```
x |--> +Infinity
x |--> -Infinity
```

```
solve(f==0,x)
```

```
[x == -4, e^(1/x) == 0]
```

```
fprime = f.differentiate(); print fprime
fdprime = fprime.differentiate(); print fdprime
```

```
x |--> -1/4*e^(1/x)/x - e^(1/x)/x^2 + 1/4*e^(1/x)
x |--> 9/4*e^(1/x)/x^3 + e^(1/x)/x^4
```

```
ES = solve(fprime==0,x); ES
```

```
[x == -1/2*sqrt(17) + 1/2, x == 1/2*sqrt(17) + 1/2, e^(1/x) == 0]
```

```
ES[1].rhs(); float(ES[1].rhs());float(fdprime(ES[1].rhs()));
```

```
1/2*sqrt(17) + 1/2
2.5615528128088303
0.23211397181875526
```

```
ES[0].rhs(); float(ES[0].rhs());float(fdprime(ES[0].rhs()));
```

```
-1/2*sqrt(17) + 1/2
-1.5615528128088303
-0.22280967877805538
```

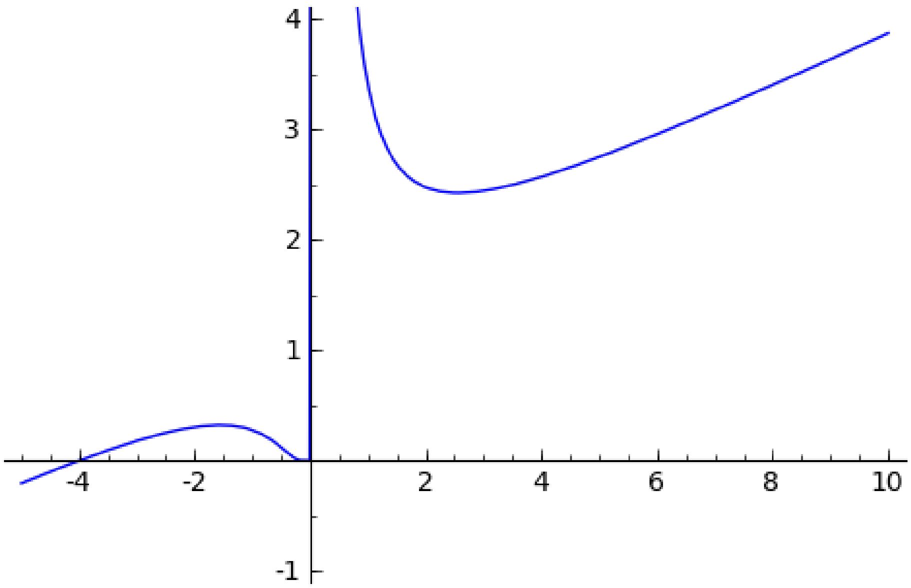
```
WP = solve(fdprime==0,x); WP
```

```
[x == (-4/9), e^(1/x) == 0]
```

```
float((fdprime.differentiate())(WP[0].rhs()))
```

```
6.0778504015171162
```

```
plot(f,xmin=-5,xmax=10,ymin=-1,ymax=4,detect_poles='true')
```



sage0.png.orig

Aufgabe 2

```
var('s')
def g(s): return integral(x^(s-1)*exp(-x),x,0,oo)
```

```
[g(m) for m in range(1,11) ]
```

```
[1, 1, 2, 6, 24, 120, 720, 5040, 40320, 362880]
```

```
(8*g(2)*g(5/2)/g(4))^2
```

```
pi
```

Aufgabe 3

```
var('a')
limit((1+a/x)^x,x=oo)
```

```
e^a
```

```
limit(sin(1/x)*x,x=0)
```

```
0
```

```
limit(sin(1/x),x=0)
```

```
ind
```

Aufgabe 4

```
var('a')
```

```
a
```

```
integral(x/(2*a*x-x^2)^(3/2),x).full_simplify()
```

```
sqrt(x)/(sqrt(2*a - x)*a)
```

```
integral((x/sqrt((2*a*x-x^2)^3)).full_simplify(),x)
```

```
sqrt(x)/(sqrt(2*a - x)*a)
```

```
integral(1/(x*sqrt(1+x^2)),x)
```

```
-arcsinh(1/abs(x))
```

Aufgabe 5

```
var('n,x,y')
assume(real(x) > 0, real(y) > 0)
f = x^(1/n)*y^(1/n)-(x*y)^(1/n)
f.simplify()
```

```
0
```

Aufgabe 6

```
factor(2*x^2-2*a^2-x^3-2*x^4+x^5+a^2*x+2*a^2*x^2-a^2*x^3)
```

```
-(x - 2)*(x - 1)*(x + 1)*(a - x)*(a + x)
```

Aufgabe 7

```
var('l,k,m')
e1=2+l-3*m;e2=1-l+m;e3=-1+l+4*m
g1=3+4*k; g2=4-k; g3=5+2*k


p = parametric_plot3d([e1,e2,e3],(l,-5,5),(m,-5,5), color='green', opacity=0.8)
p += parametric_plot3d( (g1,g2,g3), (k, -5, 5),thickness='3' )
p.show()
```

sage0-size500.jmol.orig

```
klm = solve([e1-g1,e2-g2,e3-g3],[k,l,m]); klm
```

```
[[k == (-38/17), l == (-66/17), m == (23/17)]]
```

```
schnittpunkt=vector([g1,g2,g3]).subs(k==klm[0][0].right()); schnittpunkt
```

```
(-101/17, 106/17, 9/17)
```

Aufgabe 8

```
menge = [1..1000]


[m for m in menge if (mod(m,3)==0) and (mod(m,2)==0) and (mod(m,7) ==0)]
```

```
[42, 84, 126, 168, 210, 252, 294, 336, 378, 420, 462, 504, 546, 588,
630, 672, 714, 756, 798, 840, 882, 924, 966]
```