In [1]:

```
var('x,n')
assume(n,'integer')
assume(x<1)
f(x)=1/(1-x)
show(f)
```

Out[1]:

$$x \mapsto -\frac{1}{x-1}$$

In [2]:

```
show(maxima(f(x)).powerseries(x,0)._sage_())
```

Out[2]:

$$\sum_{i_1=0}^{+\infty} x^{i_1}$$

In [3]:

```
term(x,n)=x^n
show(term)
```

Out[3]:

$$(x, n) \mapsto x^n$$

In [4]:

```
# x in (0,1)
assume(x<1)
assume(x>0)
# summing term by term x^n
s(x)=sum(term(x,n),n,0,oo)
# 1 + x + x^2 + x^3 + x^4 + x^5 + ......
show(s)
forget()
```

Out[4]:

$$x \mapsto -\frac{1}{x-1}$$

In [5]:

```
# x in (-1,0)
term(x,n)=x^n
assume(x>-1)
assume(x<0)
s(x)=sum(term(x,n),n,0,oo)
# 1 + x + x^2 + x^3 + x^4 + x^5 + ......
show(s)
forget()
```

Out[5]:

$$x \mapsto -\frac{1}{x-1}$$

In [6]:

```
dterm(x,n)=derivative(term(x,n),x)
show(dterm)
```

Out[6]:

$$(x,n) \mapsto nx^{n-1}$$

In [7]:

```
sdterm(x)=sum(dterm(x,n),n,0,oo)
show(sdterm)
```

Out[7]:

$$x \mapsto \frac{1}{x^2 - 2x + 1}$$

In [8]:

```
show(factor(sdterm))
```

Out[8]:

$$x \mapsto \frac{1}{(x-1)^2}$$

In [9]:

```
fdash(x)=derivative(f(x),x)
show(fdash)
```

Out[9]:

$$x \mapsto \frac{1}{(x-1)^2}$$

In [10]:

```
show(maxima(fdash(x)).powerseries(x,0)._sage_())
```

Out[10]:

$$\sum_{i_2=0}^{+\infty} (i_2 + 1)x^{i_2}$$

In [11]:

```
h(n)=(n+1)
show(sum(h(n)*x^n,n,0,oo))
```

Out[11]:

$$\frac{1}{x^2 - 2x + 1}$$

In [12]:

```
show(factor(sum(h(n)*x^n,n,0,oo)))
```

Out[12]:

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

In [13]:

```
assume(n>0)
iterm(x,n)=integrate(term(x,n),x)
show(iterm)
forget()
```

Out[13]:

$$(x, n) \mapsto \frac{x^{n+1}}{n+1}$$

In [14]:

```
siterm(x)=sum(iterm(x,n),n,0,oo)
show(siterm)
```

Out[14]:

$$x \mapsto -\log(-x+1)$$

In [15]:

```
#since f(x)=1/(1-x),
# then integrate f w.r.t. x gives
# g(x)=-ln(abs(1-x))
g(x)=-ln(abs(1-x))
show(g)
```

Out[15]:

$$x \mapsto -\log(|-x + 1|)$$

In [16]:

```
show(maxima(g(x)).powerseries(x,0)._sage_())
```

Out[16]:

$$\sum_{i_4=0}^{+\infty} \frac{x^{i_4+1}}{i_4 + 1}$$

In [17]:

```
hh(n)=1/(n+1)
show(sum(hh(n)*x^(n+1),n,0,oo))
```

Out[17]:

$$-\log(-x + 1)$$

In [0]: