In[1]:= (* χ_y-GENUS OF A SURFACE OF DEGREE d IN P^3 *)

```
(* Expansion of td_y(L) *)
Series[x (1 + y E ^-x) / (1 - E ^-x), {x, 0, 2}]
```

Out[1]= $(1+y)+\frac{1}{2}(1-y)\,x+\frac{1}{12}(1+y)\,x^2+O[x]^3$

In[2]:= $f[x\_] := (1+y)+\frac{1}{2}(1-y)\,x+\frac{1}{12}(1+y)\,x^2$

In[3]:= (* Integral of $i_*(td_y(X))$ over P^3 *)

```
chiy = Collect[SeriesCoefficient[d h f[h]^4 / (1 + y) / f[d h], {h, 0, 3}], y, Factor]
```

Out[3]= $\frac{1}{6}d\left(11-6d+d^2\right)-\frac{1}{3}d\left(7-6d+2d^2\right)y+\frac{1}{6}d\left(11-6d+d^2\right)y^2$

In[4]:= (* d=1 => X=P^2 *)

```
chiy /. d → 1
```

Out[4]= $1-y+y^2$

In[5]:= (* d=2 => X=P^1xP^1 *)

```
chiy /. d → 2
```

Out[5]= $1-2y+y^2$

In[6]:= (* d=3 => cubic surface, K_X=O(-1), isomorphic to a blow-up of P^2 at 6 points *)

```
chiy /. d → 3
```

Out[6]= $1-7y+y^2$

In[7]:= (* d=4, K3 surface K_X=0 *)

```
chiy /. d → 4
```

Out[7]= $2-20y+2y^2$

In[8]:= (* higher degrees, K_X positive *)

```
Do[Print["d=", k, "    χ_y = ", chiy /. d → k], {k, 5, 12}]
```

d=5 $\chi_y =$ $5-45y+5y^2$

d=6 $\chi_y =$ $11-86y+11y^2$

d=7 $\chi_y =$ $21-147y+21y^2$

d=8 $\chi_y =$ $36-232y+36y^2$

d=9 $\chi_y =$ $57-345y+57y^2$

d=10 $\chi_y =$ $85-490y+85y^2$

d=11 $\chi_y =$ $121-671y+121y^2$

d=12 $\chi_y =$ $166-892y+166y^2$