```
Expand@Integrate[ 1, {x, 1, n}, {y, 1, n / x}]
```

$$\text{ConditionalExpression}[1 - n + n \log[n], \text{Re}[n] \geq 0 \mid\mid n \notin \text{Reals}]$$

```
FullSimplify@Integrate[ t^-s y^-s, {t, 1, E^x}, {y, 1, E^x / t}]
```

$$\text{ConditionalExpression}\left[\frac{1 - (e^x)^{1-s} (1 + (-1 + s) \log[e^x])}{(-1 + s)^2}, \text{Re}[e^x] \geq 0 \mid\mid e^x \notin \text{Reals}\right]$$

```
Expand[1 / (s - 1)^2 Gamma[ 2, 0, (s - 1) n] / Gamma[2]]
```

$$\frac{\text{Gamma}[2, 0, n (-1 + s)]}{(-1 + s)^2}$$

```
Chop@N[Gamma[2, 0, 3 (-1 + -1)] / (-1 + -1)^2]
```

504.536

```
N[(1 - (e^x)^(1-s) (1 + (-1 + s) Log[e^x])) / (-1 + s)^2 /. {x → 3, s → -1}]
```

504.536

```
Grid@Table[ (-1)^k Binomial[ -z, k], {k, 0, 5}, {z, 0, 5}]
```

```
1  1  1  1   1   1
0  1  2  3   4   5
0  1  3  6  10  15
0  1  4 10  20  35
0  1  5 15  35  70
0  1  6 21  56 126
```

```
Grid@Table[ Binomial[ z + k - 1, k], {k, 0, 5}, {z, 0, 5}]
```

```
1  1  1  1   1   1
0  1  2  3   4   5
0  1  3  6  10  15
0  1  4 10  20  35
0  1  5 15  35  70
0  1  6 21  56 126
```

```
FullSimplify[D[Binomial[z, k] (-1)^k Gamma[ k, 0, -x] / Gamma[k], x]]
```

$$\frac{(-1)^k e^x (-x)^k \text{Binomial}[z, k]}{x \, \text{Gamma}[k]}$$

```
FullSimplify[(-1)^k e^x (-x)^k Binomial[z, k] / (x Gamma[k])]
```

$$\frac{(-1)^k e^x (-x)^k \text{Binomial}[z, k]}{x \, \text{Gamma}[k]}$$

$$\frac{e^x (x)^k \text{Binomial}[z, k]}{x \, \text{Gamma}[k]}$$

$$\frac{e^x x^{-1+k} \text{Binomial}[z, k]}{\text{Gamma}[k]}$$

```
Sum[(E^x x^(-1+k) Binomial[z, k])/Gamma[k], {k, 0, Infinity}]
```

$$e^x z \, \text{Hypergeometric1F1}[1 - z, 2, -x]$$

```
Sum[ Binomial[z, k] (-1)^k Gamma[ k, 0, -x] / Gamma[k], {k, 0, Infinity}]
```

$$\sum_{k=0}^{\infty} \frac{(-1)^k \, \text{Binomial}[z, k] \, \text{Gamma}[k, 0, -x]}{\text{Gamma}[k]}$$

```
ff[n_, t_] := Sum[ (t^k - 1) / k, {k, 1, Log[t, n]}]
fg[n_, t_] := Product[ ((t^k - 1)), {k, 1, Log[t, n]}]
```

```
N@ff[100, 1.001]
```

28.0218

```
N@fg[100, 1.001]
```

94 444.7

```
N@fg[100, .5]
```

1.

```
Sum[ x^k, {k, 0, Infinity}]
```

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

```
(-1)^s ( (Log[n]^s) / s + (a - 1)^s Sum[ (a^k - 1) (k^(s - 1) ), {k, 1, Log[a, n]}]) /.
 {s → 3, n → 100, a → 1.00001}
```

$-1397.76 - 4.89866 \times 10^{-16}\, i$

```
N[Gamma[ 3, 0, -Log[100]]]
```

$-1397.73 + 3.42834 \times 10^{-13}\, i$

```
(-1)^s ((-1)^s ( (Log[n]^s) / s + (a - 1)^s Sum[ (a^k - 1) (k^(s - 1) ), {k, 1, Log[a, n]}])) /
   Gamma[s] /. {s → 3, n → 100, a → 1.00001}
```

$698.878 + 2.44933 \times 10^{-16}\, i$

```
N[(-1)^3 Gamma[ 3, 0, -Log[100]] / Gamma[3.]]
```

$698.863 - 1.71417 \times 10^{-13}\, i$

```
(( (Log[n]^s) / s + (a - 1)^s Sum[ (a^k - 1) (k^(s - 1) ), {k, 1, Log[a, n]}])) / Gamma[s] /.
 {s → 3, n → 100, a → 1.00001}
```

$698.878 + 2.44933 \times 10^{-16}\, i$

```
(Log[n]^s) / (s!) + Sum[ (a - 1)^s (a^k - 1) (k^(s - 1) ), {k, 1, Log[a, n]}] / Gamma[s] /.
 {s → 3, n → 100, a → 1.00001}
```

$698.878 + 2.44933 \times 10^{-16}\, i$

```
Sum[ Binomial[z, s] (Log[n]^s) / (s!), {s, 0, Infinity}]
```

$$\text{Hypergeometric1F1}[-z, 1, -\text{Log}[n]]$$

```
Sum[ Binomial[z, s] (a - 1)^s (a^k - 1) (k^(s - 1) ) / Gamma[s],
 {s, 0, Infinity}, {k, 1, Log[a, n]}]
```

$Aborted

```
Limit[ Binomial[z, s] (a - 1)^s (a^k - 1) (k^(s - 1)) / ((s - 1)!) /. s → 5, a → 1]
```

```
0
```

```
N[Hypergeometric1F1[-z, 1, -Log[n]] /. {n → 100, z → 3}]
```

```
62.9043
```

```
LaguerreL[3, -Log[100.]]
```

```
62.9043
```

```
N[Residue[LaguerreL[-z, Log[n]] / z^2, {z, 0}]]
```

```
-1. LaguerreL^(1,0)[0., Log[n]]
```