```
Expand@Sum[ 1 / (k !) (n - 1) ^k, {k, 1, Infinity}]
 Sum[ BernoulliB[k] / (k !) (n - 1) ^k, {k, 0, Infinity}]
```

$-1+n$

```
Expand@Sum[ 1 / (k !) (n - 1) ^ (k), {k, 1, Infinity}]
 Sum[ BernoulliB[k] / (k !) (n - 1) ^ (k + a), {k, 0, Infinity}]
```

$(-1+n)^{1+a}$

```
FullSimplify@Sum[ 1 / (k !) (n - 1) ^ (k), {k, 1, Infinity}]
```

$-1+e^{-1+n}$

```
Expand@Sum[ BernoulliB[k] / (k !) (n - 1) ^ (k + a), {k, 0, Infinity}]
```

$$\frac{(-1+n)^{1+a}}{-1+e^{-1+n}}$$

```
gg[n_, rr_] :=  (-1) ^ (rr) Gamma[ rr, 0, -Log[n]] / Gamma[rr]
aa[n_, k_] := (-1) ^ (k + 1) / (k - 1) ! Integrate[ t ^ (k - 1) E^-t, {t, -Log[n], 0}]

N[Sum[ 1 / (k !) gg[20, k] , {k, 1, 100}] Sum[ BernoulliB[k] / (k !) gg[20, k], {k, 0, 120}]]
```

-254.939

```
Chop@N@gg[10, 10]
```

0.00952161

```
N[Sum[ 1 / (k !) gg[20, k] , {k, 1, 100}]]
```

49.535

```
Sum[ 1 / (k !) aa[n, k] , {k, 1, Infinity}]
```

$Aborted

```
N[aa[30, 4]]
```

96.2415

```
Chop@N[gg[30, 4]]
```

96.2415

```
Integrate[Sum[(-1) ^ (k + 1) / (k)  ((-1) ^ (k + 1) / (k - 1) ! t ^ (k - 1) E^-t) , {k, 1, Infinity}],
 {t, -Log[n], 0}]
```

ConditionalExpression[-EulerGamma + ExpIntegralEi[Log[n]] - Log[Log[n]], Log[n] > 0]

```
Integrate[Sum[BernoulliB[k] / (k !) ((-1) ^ (k + 1) / (k - 1) ! t ^ (k - 1) E^-t) ,
  {k, 0, Infinity}], {t, -Log[n], 0}]
```

$$\int_{-\mathrm{Log}[n]}^{0}\left(\sum_{k=0}^{\infty}\frac{(-1)^{1+k}\,e^{-t}\,t^{-1+k}\,\mathrm{BernoulliB}[k]}{(-1+k)\,!\,k\,!}\right)dt$$

```
aa[n_, k_] := (-1) ^ (k + 1) / (k - 1) ! Integrate[ t ^ (k - 1) E^-t, {t, -Log[n], 0}]
ab[n_, k_] := (-1) ^ (k + 1) / (k - 1) ! Integrate[ (-t) ^ (k - 1) E^t, {t, 0, Log[n]}]
ac[n_, k_] := 1 / (k - 1) ! Integrate[ t ^ (k - 1) E^t, {t, 0, Log[n]}]

Table[ N@aa[79, k], {k, 1, 5}]
```

{78., 267.186, 486.951, 611.437, 588.4}

```
Table[ N@ac[79, k], {k, 1, 5}]
```

{78., 267.186, 486.951, 611.437, 588.4}

```
Simplify[- (-1)^k (t)^(k-1)] /. {t → 3.3, k → 3}
```

10.89

```
Integrate[Sum[ Binomial[z, k] 1 / (k - 1) ! t^(k - 1) E^t, {k, 0, Infinity}],
 {t, 0, (1 - s) Log[n]}]
```

ConditionalExpression[-1 + LaguerreL[-z, Log[n] - s Log[n]],
 -1 ≤ Re[Log[n] - s Log[n]] ≤ 1 || (-1 + s) Log[n] ∉ Reals]

```
Integrate[Sum[ (-1)^(k + 1) / k 1 / (k - 1) ! t^(k - 1) E^t, {k, 1, Infinity}], {t, 0, Log[n]}]
```

-EulerGamma + ExpIntegralEi[Log[n]] - Log[Log[n]]

```
N@Sum[Binomial[3, k] 1 / (3 - 1)^k Gamma[k, 0, (3 - 1) Log[100]] / Gamma[k], {k, 1, 40}] + 1
```

3.37343

```
N@LaguerreL[-3, -1, (3 - 1) Log[100.]]
```

-2.2426×10^{6}

```
Integrate[ E^(t (1 - 0)) z Hypergeometric1F1[ 1 - z, 2, t], {t, -Log[n], 0}] /. {n → 100, z → 3}
```

$\frac{1}{200}\left(1386 - 8\,\mathrm{Log}[100] - \mathrm{Log}[100]^2\right)$

N@$\frac{1}{200}\left(1386 - 8\,\mathrm{Log}[100] - \mathrm{Log}[100]^2\right)$

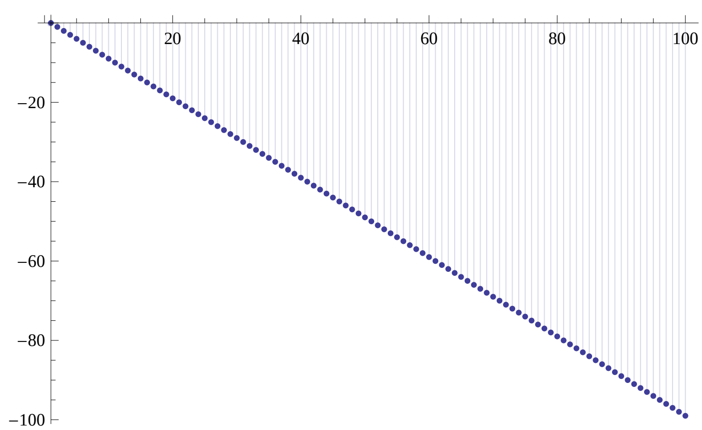
6.63976

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

2081.41

```
D[LaguerreL[-z, (1 - s) Log[100]], s]
```

```
DiscretePlot[ N[D[LaguerreL[-1 - z, 1, (1 - s) Log[n]] Log[n], z] /. {s → 0, z → 0}], {n, 1, 100}]
```




```
FullSimplify[Integrate[ (x)^-s, {x, 1, n}]]
```

ConditionalExpression[$\frac{n^{-s}\,(-n + n^{s})}{-1 + s}$, Re[n] ≥ 0 || n ∉ Reals]

Gamma[1, 0, (s – 1) Log[n]] / Gamma[1]

$1 - n^{1-s}$

Sum[(–1)^k / (k!) Binomial[–z, k] (Log[x])^k, {k, 0, Infinity}]

Hypergeometric1F1[z, 1, Log[x]]

Hypergeometric1F1[3, 1, Log[100.]]

2081.41

LaguerreL[–3, Log[100.]]

2081.41

Table[Expand[(Log[x] + Log[y])^k], {k, 1, 6}] // TableForm

$\mathrm{Log}[x] + \mathrm{Log}[y]$
$\mathrm{Log}[x]^2 + 2\,\mathrm{Log}[x]\,\mathrm{Log}[y] + \mathrm{Log}[y]^2$
$\mathrm{Log}[x]^3 + 3\,\mathrm{Log}[x]^2\,\mathrm{Log}[y] + 3\,\mathrm{Log}[x]\,\mathrm{Log}[y]^2 + \mathrm{Log}[y]^3$
$\mathrm{Log}[x]^4 + 4\,\mathrm{Log}[x]^3\,\mathrm{Log}[y] + 6\,\mathrm{Log}[x]^2\,\mathrm{Log}[y]^2 + 4\,\mathrm{Log}[x]\,\mathrm{Log}[y]^3 + \mathrm{Log}[y]^4$
$\mathrm{Log}[x]^5 + 5\,\mathrm{Log}[x]^4\,\mathrm{Log}[y] + 10\,\mathrm{Log}[x]^3\,\mathrm{Log}[y]^2 + 10\,\mathrm{Log}[x]^2\,\mathrm{Log}[y]^3 + 5\,\mathrm{Log}[x]\,\mathrm{Log}[y]^4 + \mathrm{Log}[y]^5$
$\mathrm{Log}[x]^6 + 6\,\mathrm{Log}[x]^5\,\mathrm{Log}[y] + 15\,\mathrm{Log}[x]^4\,\mathrm{Log}[y]^2 + 20\,\mathrm{Log}[x]^3\,\mathrm{Log}[y]^3 + 15\,\mathrm{Log}[x]^2\,\mathrm{Log}[y]^4 + 6\,\mathrm{Log}[x]\,\mathrm{Log}$

Grid@Table[(–1)^k / (k!) bins[–z, k] Log[x]^j Log[y]^(k – j), {k, 0, 5}, {j, 0, k}]

bins[–z, 0]					
–bins[–z, 1] Log[y]	–bins[–z, 1] Log[x]				
$\frac{1}{2}$ bins[–z, 2] $\mathrm{Log}[y]^2$	$\frac{1}{2}$ bins[–z, 2] Log[x] Log[y]	$\frac{1}{2}$ bins[–z, 2] $\mathrm{Log}[x]^2$			
$-\frac{1}{6}$ bins[–z, 3] $\mathrm{Log}[y]^3$	$-\frac{1}{6}$ bins[–z, 3] Log[x] $\mathrm{Log}[y]^2$	$-\frac{1}{6}$ bins[–z, 3] $\mathrm{Log}[x]^2$ Log[y]	$-\frac{1}{6}$ bins[–z, 3] $\mathrm{Log}[x]^3$		
$\frac{1}{24}$ bins[–z, 4] $\mathrm{Log}[y]^4$	$\frac{1}{24}$ bins[–z, 4] Log[x] $\mathrm{Log}[y]^3$	$\frac{1}{24}$ bins[–z, 4] $\mathrm{Log}[x]^2$ $\mathrm{Log}[y]^2$	$\frac{1}{24}$ bins[–z, 4] $\mathrm{Log}[x]^3$ Log[y]	$\frac{1}{24}$ bins[–z, 4] $\mathrm{Log}[x]^4$	
$-\frac{1}{120}$ bins[–z, 5] $\mathrm{Log}[y]^5$	$-\frac{1}{120}$ bins[–z, 5] Log[x] $\mathrm{Log}[y]^4$	$-\frac{1}{120}$ bins[–z, 5] $\mathrm{Log}[x]^2$ $\mathrm{Log}[y]^3$	$-\frac{1}{120}$ bins[–z, 5] $\mathrm{Log}[x]^3$ $\mathrm{Log}[y]^2$	$-\frac{1}{120}$ bins[–z, 5] $\mathrm{Log}[x]^4$ Log[y]	$-\frac{1}{120}$ bins[–z, 5] $\mathrm{Log}[x]^5$

Sum[(–1)^k / (k!) 2^k Binomial[–z, k] (Log[x])^k, {k, 0, Infinity}]

Hypergeometric1F1[z, 1, 2 Log[x]]

Sum[(Log[n])^(2 k) / ((2 k)! (2 k)), {k, 1, Infinity}]

–EulerGamma + CoshIntegral[Log[n]] – Log[Log[n]]

(LogIntegral[33.] – Log[Log[33.]] – EulerGamma) – 2 SinhIntegral[Log[33.]]

–1.83598

```
Re[(LogIntegral[1 / 33.] - Log[Log[1 / 33.]] - EulerGamma)]

-1.83598

N@LogIntegral[ 1 / (33 Log[33])] - Log[Log[ 1 / (33 Log[33])]] - EulerGamma

-2.13654 - 3.14159 i

LogIntegral[33.] - Log[Log[33.]] - EulerGamma

12.0634

FullSimplify[ (1 / Log[n]) (1 - 1 / n)]
```

$$\frac{-1+n}{n\,\mathrm{Log}[n]}$$

```
Log[n - 1] - Log[n] - Log[Log[n]] /. n → 12

Log[11] - Log[12] - Log[Log[12]]

ss[n_, x_] := Sum[ (x^k - 1) / k, {k, 1, Log[x, n]}]
ss2a[n_, x_] := Sum[ (x^k - 1) / k, {k, 1, 2 Log[x, n]}]
ss2[n_, x_] := Sum[ (x^k - 1) / k, {k, Floor[Log[x, n]], 2 Log[x, n]}]

ss[100, 1.00001] + ss2[100, 1.00001]

1243.34

LogIntegral[100.] - Log@Log@100. - EulerGamma

28.0217

ss[100, 1.00001]
ss2[100, 1.00001]

28.0218

1215.32

LogIntegral[10 000.] - Log@Log@10 000. - EulerGamma

1243.34

FullSimplify[x^k + (x + c)^k]
```

$x^k + (c + x)^k$

```
ss2[100, 1.001]

1214.86

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

n^{-s} `z Hypergeometric1F1[1 - z, 2, -Log[n]] /. s → 0`

```
Integrate[ z Hypergeometric1F1[1 - z, 2, -Log[n]], {n, 0, x}]

ConditionalExpression[LaguerreL[-z, Log[x]], Re[z] > 0]

Integrate[n z Hypergeometric1F1[1 - z, 2, -Log[n]], {n, 0, x}]
```

$$\int_0^x n\, z\, \mathrm{Hypergeometric1F1}[1 - z, 2, -\mathrm{Log}[n]]\, dn$$

```
Limit[(a - 1)^s (-1)^s Sum[ a^k k^(s - 1), {k, 1, Log[a, n]}] /. {n → 100, s → 7 / 2}, a → 1]
```

```
N[-i (-1 + a)^(7/2) (-100 a LerchPhi[a, -5/2, 1 + Log[100]/Log[a]] + PolyLog[-5/2, a]) /. a → 1.000001]
```

$2.60253 \times 10^{-10} - 2782.57\, i$

```
N[6 - 6 n + 6 n Log[n] - 3 n Log[n]^2 + n Log[n]^3 /. n → 100]
```

5573.28

```
Chop@Gamma[3.5, 0, -Log[100.]]
```

0. - 2782.56 i

```
N@Sum[ Re[n^k / ( k ! k)] /. {n → Log[12 000], z → 5.5}, {k, 1, 25}]
```

1458.28

```
gg[n_, k_] :=
 If[ k == 0, Limit[ Gamma[kk, 0, -Log[n]] / Gamma[kk], kk → k], Gamma[k, 0, -Log[n]] / Gamma[k]]
N@Sum[ Re[(-1)^k (-1)^(k + 1) / k gg[n, k] /. {n → 12 000, z → 5}], {k, 1, 40}]
```

1458.28

```
FullSimplify[D[(-1)^k 1 / (k!) Binomial[-z, k], z] n^k ]
```

$$\frac{1}{k!} (-1)^k n^k \,\text{Binomial}[-z, k] \,(\text{HarmonicNumber}[-k - z] - \text{HarmonicNumber}[-z])$$

```
Limit[ ((-1)^kk Gamma[kk, 0, -Log[100]] / Gamma[kk] - 1) / kk, kk → 0]
```

i π - Gamma[0, -Log[100]]

```
pp[ n_, z_] :=
  (((-1)^z Gamma[z, 0, -Log[n]] / Gamma[z]) - ((-1)^-z Gamma[-z, 0, -Log[n]] / Gamma[-z])) /
   (2 z)
pp2[ n_, z_] := (((-1)^z Gamma[z, 0, -Log[n]] / Gamma[z]) - 1) / z
```

```
pp[100, .000001]
```

30.1261 + 6.28319 i

```
D[ LogIntegral[n] - Log@Log@n - EulerGamma, n]
```

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

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

27.4193

```
-N@Sum[ (-1)^i Binomial[ -z - 1 + 1, -z - 1 - i] Log[ n]^i / i!, {i, 0, -z - 1}] / n /.
  {z → 3, n → 100}
```

27.4193

```
D[ LaguerreL[-z, Log[n]], n]
```

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

```
Sum[ (-1)^i Binomial[-z - 1 + 1, -z - 1 - i] Log[n]^i / i!, {i, 0, -z - 1}] / n
```

$$-\frac{z\,\text{Hypergeometric1F1}[1+z,\,2,\,\text{Log}[n]]}{n}$$

```
D[(-1)^z, z]
```

$i\,(-1)^z\,\pi$

```
FullSimplify@D[(-1)^z Gamma[z, 0, -Log[n]] / Gamma[z], z]
```

$Aborted

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

30.1261 + 3.14159 i

```
D[ LogIntegral[n] - Log@Log@n - EulerGamma, n]
```

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

```
D[LogIntegral[n] - Log@Log@n - EulerGamma, n] /. n → 20
```

$$\frac{19}{20\,\text{Log}[20]}$$

```
FullSimplify@(1 / Log[n]) (1 - 1 / n) /. n → 20
```

$$\frac{19}{20\,\text{Log}[20]}$$

```
Limit[ (1 / Log[x]) (1 - 1 / x), x → 1]
```

1

```
Limit[ 1 / Log[x], x → 1]
```

∞

```
Expand[(1 / Log[x]) (1 - 1 / x)]
```

$$\frac{1}{\text{Log}[x]}-\frac{1}{x\,\text{Log}[x]}$$

```
D[ 1 / Log[x], x]
```

$$-\frac{1}{x\,\text{Log}[x]^2}$$

```
D[ 1 - 1 / x, x]
```

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

```
LogIntegral[1]
```

$-\infty$

```
Limit[ LogIntegral[ 1 + x] / x, x → 0]
```

$-\infty$

```
Integrate[ (x - 1) / ( Log[x]), x]
```

ExpIntegralEi[2 Log[x]] - LogIntegral[x]

```
N@ExpIntegralEi[2 Log[x]] - LogIntegral[x] /. x → 10

23.9605

N@LogIntegral[ 100] - LogIntegral[10]

23.9605

Integrate[ (1 - 1 / x) (x^ (-1)) / ( Log[x]), x]

-ExpIntegralEi[-Log[x]] + Log[Log[x]]

N@ExpIntegralEi[3 Log[x]] /. x → 30

2984.42

N@Log@Log@30 - N@LogIntegral[ 30^-1]

1.23201

N@Integrate[ (1 - 1 / x) (x^z / Log[x]), x]

-1. ExpIntegralEi[z Log[x]] + ExpIntegralEi[(1. + z) Log[x]]

Integrate[ x^z / Log[x], x]

ExpIntegralEi[(1 + z) Log[x]]

Integrate[ 1 - 1 / x, x]

x - Log[x]

Expand[ (1 - 1 / x) (x^z / Log[x]), x]
```

$$-\frac{x^{-1+z}}{\mathrm{Log}[x]}+\frac{x^{z}}{\mathrm{Log}[x]}$$

```
Limit[ LogIntegral[x^5] - Log[Log[x]], x → 1]

EulerGamma + Log[5]

Limit[ LogIntegral[x^2] - LogIntegral[x], x → 1]

Log[2]

Limit[ LogIntegral[x^2] - LogIntegral[x^-2], x → 1]

0

Limit[ LogIntegral[x^5] - LogIntegral[x^-2], x → 1]
```

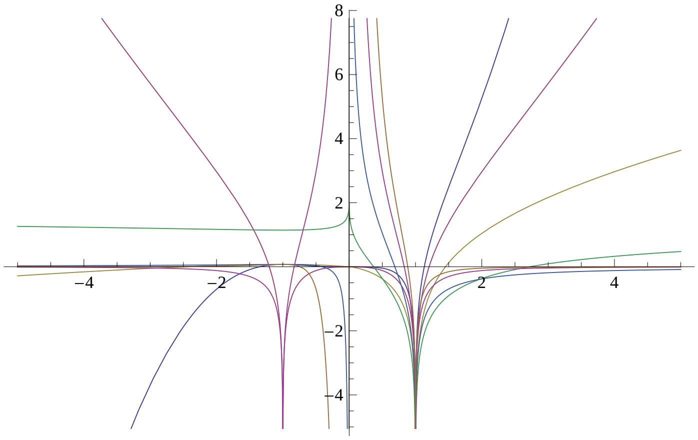
$$\mathrm{Log}\left[\frac{5}{2}\right]$$

```
Limit[ LogIntegral[x^5] - LogIntegral[x^3], x → 1]
```

$$\mathrm{Log}\left[\frac{5}{3}\right]$$

```
Limit[ LogIntegral[x^6] - LogIntegral[x^ (1 / 10)], x → 1]

Log[60]

 Limit[ LogIntegral[x^2] - Log[Log[x]], x → 1]

EulerGamma + Log[2]

Integrate[ x^-1 / Log[x], x]

Log[Log[x]]
```

```
Plot[{Re@ LogIntegral[x^3], Re@ LogIntegral[x^2], Re@ LogIntegral[x], Re@ Log[Log[x]],
  Re@ LogIntegral[x^-1], Re@ LogIntegral[x^-2], Re@ LogIntegral[x^-3]}, {x, -5, 5}]
```




```
D[LogIntegral[x^s], x]
```

$$\frac{s\,x^{-1+s}}{\text{Log}[x^s]}$$

$$\text{Limit}\left[\frac{s\,x^{-1+s}}{\text{Log}[x^s]},\ s \to 0\right]$$

$$\frac{1}{x\,\text{Log}[x]}$$

$$\text{Integrate}\left[\frac{1}{x\,\text{Log}[x]},\ x\right]$$

```
Log[Log[x]]
```

```
Animate[ Plot[{Re@ LogIntegral[x^y]}, {x, 29, 31}], {y, -1, 1}]
```

```
Limit[ LogIntegral[x^z], z → .000000001] /. x → 30
```

−18.9219

$$\text{Integrate}\left[\frac{s\,x^{-1+s}}{\text{Log}[x^s]},\ x\right]$$

$$\text{LogIntegral}[x^s]$$

$$\text{Limit}\left[\frac{s\,x^{-1+s}}{\text{Log}[x^s]},\ x \to 1\right]$$

$$s\,\text{DirectedInfinity}\left[\frac{1}{\text{Sign}[s]}\right]$$

$$\frac{s\,x^{-1+s}}{s\,\text{Log}[x]}$$

$$\text{Integrate}\left[\frac{x^{-1+s}}{\text{Log}[x]},\ x\right]$$

```
ExpIntegralEi[s Log[x]]
```

```
Limit[x^(-1+s)/Log[x], x → 1]
```

∞

```
Integrate[x^-1 / (Log[x]), x]
```

```
Log[Log[x]]
```

```
Integrate[ x^(s - 1), x]
```

$\frac{x^s}{s}$

```
D[LogIntegral[x^s], x]
```

$\frac{s\, x^{-1+s}}{\mathrm{Log}[x^s]}$

```
Integrate[ x^(s) x^(t), x]
```

$\frac{x^{1+s+t}}{1+s+t}$

```
Expand[Integrate[ (x^(s - 1) / Log[x]) (x^(t - 1) / Log[x]),
   {x, 0, 20}, PrincipalValue → True]] /. {s → 4, t → 4}
```

Integrate::idiv : Integral of $\frac{x^6}{\mathrm{Log}[x]^2}$ does not converge on {0, 20}. ≫

$\mathrm{Integrate}\left[\frac{x^6}{\mathrm{Log}[x]^2}, \{x, 0, 20\}, \mathrm{PrincipalValue} \to \mathrm{True}\right]$

```
N[LogIntegral[x^4] LogIntegral[x^4] /. x → 20]
```

2.16967×10^8

$\mathrm{N}\left[7\,\mathrm{ExpIntegralEi}[7\,\mathrm{Log}[x]] - \frac{x^7}{\mathrm{Log}[x]}\right] /.\ x \to 20$

2.26681×10^7

```
Expand[Integrate[ (x^(s - 1) / Log[x]), x]] /. {s → 4}
```

```
ExpIntegralEi[4 Log[x]]
```

```
N[LogIntegral[x^4] /. x → 20]
```

14 729.8

```
N[ExpIntegralEi[4 Log[x]] /. x → 20]
```

14 729.8

$7\,\mathrm{ExpIntegralEi}[7\,\mathrm{Log}[x]] - \frac{x^7}{\mathrm{Log}[x]} /.\ x \to 1$

Power::infy : Infinite expression $\frac{1}{0}$ encountered. ≫

Infinity::indet : Indeterminate expression ComplexInfinity + −∞ encountered. ≫

```
Indeterminate
```

```
FullSimplify@Integrate[ x^(s - 1) / Log[x^2], x]
```

$$\frac{1}{2} x^s \left(x^2\right)^{-s/2} \text{ExpIntegralEi}\left[\frac{1}{2} s \text{Log}\left[x^2\right]\right]$$

$$N\left[\frac{1}{2} x^s \left(x^2\right)^{-s/2} \text{ExpIntegralEi}\left[\frac{1}{2} s \text{Log}\left[x^2\right]\right] \text{ /. } \{x \to 100, s \to 1\}\right]$$

15.0631

$$N\left[\frac{1}{2} x^s \left(x^2\right)^{-s/2} \text{LogIntegral}[x\text{^}s] \text{ /. } \{x \to 100, s \to 2\}\right]$$

623.069

$$N\left[\frac{1}{2} \text{LogIntegral}[x\text{^}s] \text{ /. } \{x \to 100, s \to 2\}\right]$$

623.069

$$N\left[\frac{1}{2} x^s \left(x^2\right)^{-s/2} \text{ExpIntegralEi}\left[\frac{1}{2} s \text{Log}\left[x^2\right]\right] \text{ /. } \{x \to 30, s \to 3\}\right]$$

1492.21

```
N@LogIntegral[30^3] / 2
```

1492.21

```
FullSimplify@Integrate[ x^(s - 1) / Log[x^3], x]
```

$$\frac{1}{3} x^s \left(x^3\right)^{-s/3} \text{ExpIntegralEi}\left[\frac{1}{3} s \text{Log}\left[x^3\right]\right]$$

$$N\left[\frac{1}{3} x^s \left(x^3\right)^{-s/3} \text{ExpIntegralEi}\left[\frac{1}{3} s \text{Log}\left[x^3\right]\right] \text{ /. } \{x \to 40, s \to 4\}\right]$$

62 438.2

```
N@LogIntegral[40^4] / 3
```

62 438.2

```
Integrate[ x^(-1) Log[x]^k, x]
```

$$\frac{\text{Log}[x]^{1+k}}{1+k}$$

```
LogIntegral[ x^s] / k
Integrate[ x^-1 Log[x]^-1, x]
```

Log[Log[x]]

```
Integrate[ LogIntegral[x], x]
```

-ExpIntegralEi[2 Log[x]] + x LogIntegral[x]

```
Integrate[ LogIntegral[x^2], x] /. x → 10
```

$$-\text{ExpIntegralEi}\left[\frac{3 \text{Log}[100]}{2}\right] + 10 \text{LogIntegral}[100]$$

```
Integrate[ LogIntegral[x^3], x] /. x → 10
```

$$-\text{ExpIntegralEi}\left[\frac{4 \text{Log}[1000]}{3}\right] + 10 \text{LogIntegral}[1000]$$

```
Integrate[Log[Log[x]], x]

x Log[Log[x]] - LogIntegral[x]

Integrate[ LogIntegral[x^(1 / 500)], {x, 0, 1}]

-Log[501]

Integrate[ Log[Log[x]], {x, 0, 1}]

-EulerGamma + ⅈ π

Integrate[Log[x], {x, 0, 1}]

-1

p[n_, k_] = Sum[1 / k - p[n / j, k - 1], {j, 2, k}]
p[100, 1]

$RecursionLimit::reclim : Recursion depth of 256 exceeded. ≫

$RecursionLimit::reclim : Recursion depth of 256 exceeded. ≫

$RecursionLimit::reclim : Recursion depth of 256 exceeded. ≫

General::stop : Further output of $RecursionLimit::reclim will be suppressed during this calculation. ≫

$IterationLimit::itlim : Iteration limit of 4096 exceeded. ≫

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$IterationLimit::itlim : Iteration limit of 4096 exceeded. ≫

General::stop : Further output of $IterationLimit::itlim will be suppressed during this calculation. ≫

D[ n!, n]

Gamma[1 + n] PolyGamma[0, 1 + n]

Grid[Table[ Integrate[ x^(s - 1) / (Log[x]^k), x], {k, -4, 4}, {s, -4, 4}]]
```

$-3/(128\ x^4) - (3\ \text{Log}[x])/(32\ x^4) - (3\ \text{Log}[x]^2)/(16\ x^4) - \text{Log}[x]^3/(4\ x^4) - \text{Log}[x]^4/(4\ x^4)$	$-8/(81\ x^3) - (8\ \text{Log}[x])/(27\ x^3) - (4\ \text{Log}[x]^2)/(9\ x^3) - (4\ \text{Log}[x]^3)/(9\ x^3) - \text{Log}[x]^4/(3\ x^3)$	$-\frac{3}{4\ x^2} - (3\ \text{Log}[x])/(2\ x^2) - (3\ \text{Log}[x]^2)/(2\ x^2) - \text{Log}[x]^3/x^2 - \text{Log}[x]^4/(2\ x^2)$	$-\frac{24}{x} - \frac{1}{x} 24\ \text{Log}[x] - \frac{1}{x} 12\ \text{Log}[x]^2 - \frac{1}{x} 4\ \text{Log}[x]^3 - \frac{1}{x} \text{Log}[x]^4$	$\frac{\text{Log}[x]^5}{5}$	$24\ x - 24\ x\ \text{Log}[x] + 12\ x\ \text{Log}[x]^2 - 4\ x\ \text{Log}[x]^3 + x\ \text{Log}[x]^4$	$\frac{3\ x^2}{4} - \frac{3}{2} x^2\ \text{Log}[x] + \frac{3}{2} x^2\ \text{Log}[x]^2 - x^2\ \text{Log}[x]^3 + \frac{1}{2} x^2\ \text{Log}[x]^4$	$\frac{8\ x^3}{81} - \frac{8}{27} x^3\ \text{Log}\ x]\ \frac{4}{9} x^3\ \text{Log}\ x\ \frac{4}{9} x^3\ \text{Log}\ x\ \frac{1}{3} x^3\ \text{Log}\ x$
$-3/(128\ x^4) - (3\ \text{Log}[x])/(32\ x^4) - (3\ \text{Log}[x]^2)/(16\ x^4) - \text{Log}[x]^3/(4\ x^4)$	$-2/(27\ x^3) - (2\ \text{Log}[x])/(9\ x^3) - \text{Log}[x]^2/(3\ x^3) - \text{Log}[x]^3/(3\ x^3)$	$-\frac{3}{8\ x^2} - (3\ \text{Log}[x])/(4\ x^2) - (3\ \text{Log}[x]^2)/(4\ x^2) - \text{Log}[x]^3/(2\ x^2)$	$-\frac{6}{x} - \frac{1}{x} 6\ \text{Log}[x] - \frac{1}{x} 3\ \text{Log}[x]^2 - \frac{1}{x} \text{Log}[x]^3$	$\frac{\text{Log}[x]^4}{4}$	$-6\ x + 6\ x\ \text{Log}[x] - 3\ x\ \text{Log}[x]^2 + x\ \text{Log}[x]^3$	$-\frac{3\ x^2}{8} + \frac{3}{4} x^2\ \text{Log}[x] - \frac{3}{4} x^2\ \text{Log}[x]^2 + \frac{1}{2} x^2\ \text{Log}[x]^3$	$-\frac{2\ x^3}{27} + \frac{2}{9} x^3\ \text{Log}\ x]\ \frac{1}{3} x^3\ \text{Log}\ x\ \frac{1}{3} x^3\ \text{Log}\ x$
$-1/(32\ x^4) - \frac{\text{Log}[x]}{8\ x^4} - \text{Log}[x]^2/(4\ x^4)$	$-2/(27\ x^3) - (2\ \text{Log}[x])/(9\ x^3) - \text{Log}[x]^2/(3\ x^3)$	$-\frac{1}{4\ x^2} - \frac{\text{Log}[x]}{2\ x^2} - \text{Log}[x]^2/(2\ x^2)$	$-\frac{2}{x} - \frac{1}{x} 2\ \text{Log}[x] - \frac{1}{x} \text{Log}[x]^2$	$\frac{\text{Log}[x]^3}{3}$	$2\ x - 2\ x\ \text{Log}[x] + x\ \text{Log}[x]^2$	$\frac{x^2}{4} - \frac{1}{2} x^2\ \text{Log}[x] + \frac{1}{2} x^2\ \text{Log}[x]^2$	$\frac{2\ x^3}{27} - \frac{2}{9}\ x^3\ \text{L}\ x]\ \frac{1}{3} x^3\ \text{Log}\ x$

$-1/(16\,x^4) - \frac{Log[x]}{4\,x^4}$	$-\frac{1}{9\,x^3} - \frac{Log[x]}{3\,x^3}$	$-\frac{1}{4\,x^2} - \frac{Log[x]}{2\,x^2}$	$-\frac{1}{x} - \frac{Log[x]}{x}$	$\frac{Log[x]^2}{2}$	$-x + x\,Log[x]$	$-\frac{x^2}{4} + \frac{1}{2}\,x^2\,Log[x]$	$-\frac{x^3}{9} + \frac{1}{3}\,x^3$ Log
$-\frac{1}{4\,x^4}$	$-\frac{1}{3\,x^3}$	$-\frac{1}{2\,x^2}$	$-\frac{1}{x}$	Log[x]	x	$\frac{x^2}{2}$	$\frac{x^3}{3}$
ExpIntegralEi[−4 Log[x]]	ExpIntegralEi[−3 Log[x]]	ExpIntegralEi[−2 Log[x]]	ExpIntegralEi[−Log[x]]	Log[Log[x]]	LogIntegral[x]	ExpIntegralEi[2 Log[x]]	ExpIntgral 3 Log x]]
-4 ExpIntegralEi[−4 Log[x]] − $1/(x^4$ Log[x])	-3 ExpIntegralEi[−3 Log[x]] − $1/(x^3$ Log[x])	-2 ExpIntegralEi[−2 Log[x]] − $1/(x^2$ Log[x])	−ExpIntegralEi[−Log[x]] − 1/(x Log[x])	$-\frac{1}{Log[x]}$	−x / Log[x] + LogIntegral[x]	2 ExpIntegralEi[2 Log[x]] − $\frac{x^2}{Log[x]}$	3 ExpI te al 3 L x] $\frac{x^3}{Log[x]}$
8 ExpIntegralEi[−4 Log[x]] − $1/(2\,x^4$ Log[x]^2) + $2/(x^4$ Log[x])	$\frac{9}{2}$ ExpIntegralEi[−3 Log[x]] − $1/(2\,x^3$ Log[x]^2) + $3/(2\,x^3$ Log[x])	2 ExpIntegralEi[−2 Log[x]] − $1/(2\,x^2$ Log[x]^2) + $1/(x^2$ Log[x])	$\frac{1}{2}$ ExpIntegralEi[−Log[x]] − 1/(2 x Log[x]^2) + 1/(2 x Log[x])	−1/(2 Log[x]^2)	−x/(2 Log[x]^2) − x/(2 Log[x]) + $\frac{1}{2}$ LogIntegral[x]	2 ExpIntegralEi[2 Log[x]] − x^2/(2 Log[x]^2) − $\frac{x^2}{Log[x]}$	$\frac{9}{2}$ ExpIr eg Ei 3 Lo x] x^3/(2 Lo x] − (3 x^3) (2 Lo x]
$-\frac{32}{3}$ ExpIntegralEi[−4 Log[x]] − $1/(3\,x^4$ Log[x]^3) + $2/(3\,x^4$ Log[x]^2) − $8/(3\,x^4$ Log[x])	$-\frac{9}{2}$ ExpIntegralEi[−3 Log[x]] − $1/(3\,x^3$ Log[x]^3) + $1/(2\,x^3$ Log[x]^2) − $3/(2\,x^3$ Log[x])	$-\frac{4}{3}$ ExpIntegralEi[−2 Log[x]] − $1/(3\,x^2$ Log[x]^3) + $1/(3\,x^2$ Log[x]^2) − $2/(3\,x^2$ Log[x])	$-\frac{1}{6}$ ExpIntegralEi[−Log[x]] − 1/(3 x Log[x]^3) + 1/(6 x Log[x]^2) − 1/(6 x Log[x])	−1/(3 Log[x]^3)	−x/(3 Log[x]^3) − x/(6 Log[x]^2) − x/(6 Log[x]) + $\frac{1}{6}$ LogIntegral[x]	$\frac{4}{3}$ ExpIntegralEi[2 Log[x]] − x^2/(3 Log[x]^3) − x^2/(3 Log[x]^2) − (2 x^2) / (3 Log[x])	$\frac{9}{2}$ ExpIn gra 3 Log x]] x^3/(3 Log x]^3 x^3/(2 Log x]^2 (3 x^3) (2 Log x])

```
Integrate[x^(s-1) (Log[x]^k), x] /. {s → 1, x → 10}
```

```
-(-1)^(-1-k) Gamma[1 + k, -Log[10]]
```

Log[x]^(1+k) (-s Log[x])^(-1-k) /. x → 30

```
(-s)^(-1-k)
```

Table[(-1)^k, {k, -4, 4}]

```
{1, -1, 1, -1, 1, -1, 1, -1, 1}
```

-(-s)^(-1+k) Gamma[1 - k, -s Log[x]]

```
-(-s)^(-1+k) Gamma[1 - k, -s Log[x]]
```

(-1)^k Gamma[1 + k, -Log[x]]

```
(-1)^k Gamma[1 + k, -Log[x]]
```

Integrate[1 / (Log[x]^k), x] /. {x → 20}

```
(-1)^k Gamma[1 - k, -Log[20]]
```

Limit[(-1)^(k) Integrate[(Log[x]^(k)), x], x → 1]

```
Gamma[1 + k, 0]
```

N@Gamma[5, -Log[1.01]]

```
24. - 1.20448 × 10^-26 i
```

(4.5 + I) !

```
-2.21893 + 47.3558 i
```

Limit[Integrate[(-1)^k (Log[x]^k), x], x → 1] /. k → 7

```
5040
```

-Integrate[(Log[1 / x]^k), {x, 1, n}]

```
ConditionalExpression[Gamma[1 + k] - Gamma[1 + k, -Log[n]], Re[k] > -1 && Log[n] > 0]
```

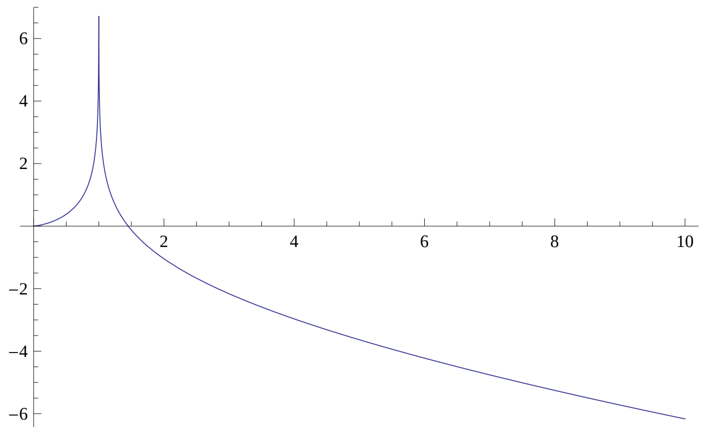
N[-Integrate[(Log[1 / x]^3), {x, 1, n}] /. n → 100]

```
5573.28
```

Chop@Gamma[4, 0, -Log[100.]]

```
5573.28
```

```
Plot[-ExpIntegralEi[-Log[1/x]], {x, 0, 10}]
```




```
Integrate[1 / Log[1 / x], x]
```

```
-ExpIntegralEi[-Log[1/x]]
```

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

```
ConditionalExpression[1 - n + n Log[n], Re[n] ≥ 0 || n ∉ Reals]
```

```
FullSimplify@Integrate[ Log[x]^z, {x, 1, n}]
```

```
ConditionalExpression[(-z Gamma[z] + Gamma[1 + z, -Log[n]]) (-Log[n])^-z Log[n]^z, Re[z] > -1]
```

```
FullSimplify@Integrate[ (1 / x)^z, {x, 1, n}]
```

```
ConditionalExpression[-(-1 + (1/n)^(-1+z))/(-1 + z), Re[n] ≥ 0 || n ∉ Reals]
```

```
(-z Gamma[z] + Gamma[1 + z, -Log[n]]) (-Log[n])^-z Log[n]^z /. n → 100
```

```
(-1)^-z (-z Gamma[z] + Gamma[1 + z, -Log[100]])
```

```
FullSimplify[-(-1 + (1/n)^(-1+z))/(-1 + z)] /. n → 200
```

```
-(-1 + 200^(1-z))/(-1 + z)
```

```
Integrate[ Log[1 / x]^z, x]
```

```
Gamma[1 + z, Log[1/x]]
```

```
Integrate[ x^-1 Log[x]^-1, x]
```

```
Log[Log[x]]
```

```
Integrate[ x^(s - 1) Log[x]^(k - 1), x] /. {x → 10}
```

```
-(-s)^-k Gamma[k, -s Log[10]]
```

```
Integrate[ 1 / (x Log[x]), x]
```

```
Log[Log[x]]
```

```
Integrate[ x^(k - 1) (E^x)^(s), x]
```

$-e^{-s x} (e^x)^s x^k (-s x)^{-k}$ Gamma[k, -s x]

FullSimplify$[-e^{-s x} (e^x)^s x^k (-s x)^{-k}$ Gamma[k, -s x] /. x → 10]

$-(-s)^{-k}$ Gamma[k, -10 s]

```
Integrate[ (E^x)^(0) x^(0 - 1) , x]
```

Log[x]

$-e^{-s x} (e^x)^s x^k (-s x)^{-k}$ Gamma[k, -s x] /. s → -1

-Gamma[k, x]

```
Limit[ -Gamma[k, x] + Gamma[k, 0], x → Infinity] /. k → 8
```

5040

```
Integrate[ x^-2 Log[ x]^(k - 1), {x, 1, Infinity}]
```

ConditionalExpression[Gamma[k], Re[k] > 0]

```
Integrate[ (-Log[ x])^k / (x^2), {x, 1, n}]
```

ConditionalExpression$[(-1)^k$ (Gamma[1 + k] - Gamma[1 + k, Log[n]]), Re[k] > -1 && Log[n] > 0]

```
Integrate[ (Log[x]^(k - 1) / x^2) (Log[y])^(-k) / (y^2), {x, 1, Infinity}, {y, 1, Infinity}]
```

ConditionalExpression[Gamma[1 - k] Gamma[k], Re[k] > 0]

```
Pi / Sin[ Pi 3.2]
```

-5.3448

```
Expand[(Log[x]^(k - 1) / x^2) (Log[y])^(-k) / (y^2)]
```

$$\frac{\text{Log}[x]^{-1+k}\,\text{Log}[y]^{-k}}{x^2\,y^2}$$

```
Integrate[ Log[x]^k / x^2, {x, 1, Infinity}]
```

ConditionalExpression[Gamma[1 + k], Re[k] > -1]

```
Integrate[ (E^x)^s x^(k - 1), x] /. x → 10
```

$-(-s)^{-k}$ Gamma[k, -10 s]

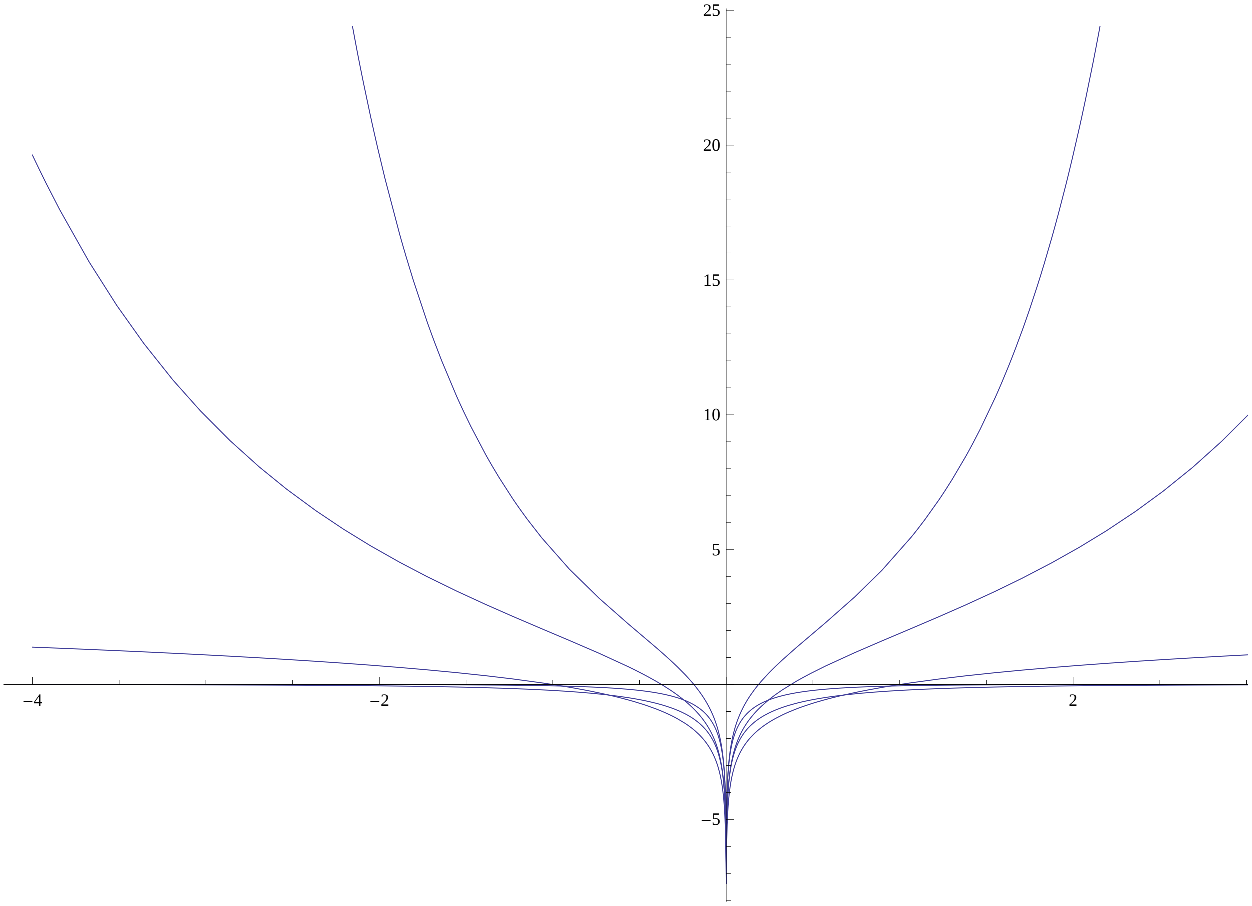
```
Grid[Table[Expand@Integrate[ x^(s - 1) Log[x]^(k - 1), x], {k, -2, 2}, {s, -2, 2}]]
```

$2\,\text{ExpIntegralEi}[-2\,\text{Log}[x]] - \frac{1}{2 x^2 \text{Log}[x]^2} + \frac{1}{x^2 \text{Log}[x]}$	$\frac{1}{2}\,\text{ExpIntegralEi}[-\text{Log}[x]] - \frac{1}{2 x \text{Log}[x]^2} + \frac{1}{2 x \text{Log}[x]}$	$-\frac{1}{2 \text{Log}[x]^2}$	$-\frac{x}{2 \text{Log}[x]^2} - \frac{x}{2 \text{Log}[x]} + \frac{\text{LogIntegral}[x]}{2}$	$2\,\text{ExpIntegralEi}[2\,\text{Log}[x]] - \frac{x^2}{2 \text{Log}[x]^2} - \frac{x^2}{\text{Log}[x]}$
$-2\,\text{ExpIntegralEi}[-2\,\text{Log}[x]] - \frac{1}{x^2 \text{Log}[x]}$	$-\text{ExpIntegralEi}[-\text{Log}[x]] - \frac{1}{x \text{Log}[x]}$	$-\frac{1}{\text{Log}[x]}$	$-\frac{x}{\text{Log}[x]} + \text{LogIntegral}[x]$	$2\,\text{ExpIntegralEi}[2\,\text{Log}[x]] - \frac{x^2}{\text{Log}[x]}$
$\text{ExpIntegralEi}[-2\,\text{Log}[x]]$	$\text{ExpIntegralEi}[-\text{Log}[x]]$	$\text{Log}[\text{Log}[x]]$	$\text{LogIntegral}[x]$	$\text{ExpIntegralEi}[2\,\text{Log}[x]]$
$-\frac{1}{2 x^2}$	$-\frac{1}{x}$	$\text{Log}[x]$	x	$\frac{x^2}{2}$
$-\frac{1}{4 x^2} - \frac{\text{Log}[x]}{2 x^2}$	$-\frac{1}{x} - \frac{\text{Log}[x]}{x}$	$\frac{\text{Log}[x]^2}{2}$	$-x + x\,\text{Log}[x]$	$-\frac{x^2}{4} + \frac{1}{2} x^2\,\text{Log}[x]$

```
Grid[Table[Expand@Integrate[ (E^x)^s x^(k - 1), x], {k, -2, 2}, {s, -2, 2}]]
```

$-\frac{e^{-2x}}{2 x^2} + \frac{e^{-2x}}{x} + 2\,\text{ExpIntegralEi}[-2x]$	$-\frac{e^{-x}}{2 x^2} + \frac{e^{-x}}{2x} + \frac{1}{2}\,\text{ExpIntegralEi}[-x]$	$-\frac{1}{2 x^2}$	$-\frac{e^{x}}{2 x^2} - \frac{e^{x}}{2x} + \frac{\text{ExpIntegralEi}[x]}{2}$	$-\frac{e^{2x}}{2 x^2} - \frac{e^{2x}}{x} + 2\,\text{ExpIntegralEi}[2x]$
$-\frac{e^{-2x}}{x} - 2\,\text{ExpIntegralEi}[-2x]$	$-\frac{e^{-x}}{x} - \text{ExpIntegralEi}[-x]$	$-\frac{1}{x}$	$-\frac{e^{x}}{x} + \text{ExpIntegralEi}[x]$	$-\frac{e^{2x}}{x} + 2\,\text{ExpIntegralEi}[2x]$
$\text{ExpIntegralEi}[-2x]$	$\text{ExpIntegralEi}[-x]$	$\text{Log}[x]$	$\text{ExpIntegralEi}[x]$	$\text{ExpIntegralEi}[2x]$
$-\frac{1}{2} e^{-2x}$	$-e^{-x}$	x	e^{x}	$\frac{e^{2x}}{2}$
$-\frac{1}{4} e^{-2x} - \frac{1}{2} e^{-2x} x$	$-e^{-x} - e^{-x} x$	$\frac{x^2}{2}$	$-e^{x} + e^{x} x$	$-\frac{e^{2x}}{4} + \frac{1}{2} e^{2x} x$

```
Plot[Re[{ExpIntegralEi[-2 x], ExpIntegralEi[-x],
   Log[x], ExpIntegralEi[x], ExpIntegralEi[2 x]}], {x, -4, 4}]
```



```
Grid[Table[Integrate[ x^(s - 1) Log[x]^(k - 1), {x, 1, Infinity}], {k, 1, 6}, {s, -6, -1}]]
```

$\frac{1}{6}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	1
$\frac{1}{36}$	$\frac{1}{25}$	$\frac{1}{16}$	$\frac{1}{9}$	$\frac{1}{4}$	1
$\frac{1}{108}$	$\frac{2}{125}$	$\frac{1}{32}$	$\frac{2}{27}$	$\frac{1}{4}$	2
$\frac{1}{216}$	$\frac{6}{625}$	$\frac{3}{128}$	$\frac{2}{27}$	$\frac{3}{8}$	6
$\frac{1}{324}$	$\frac{24}{3125}$	$\frac{3}{128}$	$\frac{8}{81}$	$\frac{3}{4}$	24
$\frac{5}{1944}$	$\frac{24}{3125}$	$\frac{15}{512}$	$\frac{40}{243}$	$\frac{15}{8}$	120

```
Grid[Table[Gamma[k] (-s)^-k, {k, 1, 6}, {s, -6, -1}]]
```

$\frac{1}{6}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	1
$\frac{1}{36}$	$\frac{1}{25}$	$\frac{1}{16}$	$\frac{1}{9}$	$\frac{1}{4}$	1
$\frac{1}{108}$	$\frac{2}{125}$	$\frac{1}{32}$	$\frac{2}{27}$	$\frac{1}{4}$	2
$\frac{1}{216}$	$\frac{6}{625}$	$\frac{3}{128}$	$\frac{2}{27}$	$\frac{3}{8}$	6
$\frac{1}{324}$	$\frac{24}{3125}$	$\frac{3}{128}$	$\frac{8}{81}$	$\frac{3}{4}$	24
$\frac{5}{1944}$	$\frac{24}{3125}$	$\frac{15}{512}$	$\frac{40}{243}$	$\frac{15}{8}$	120

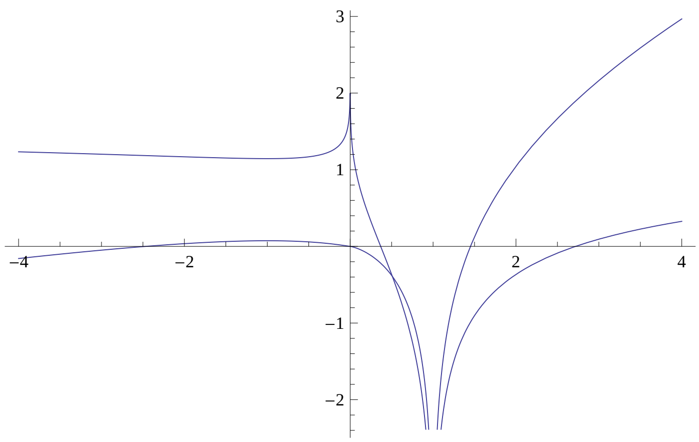
```
Integrate[ x^(s-1) Log[x]^(k-1), {x, 1, Infinity}]
```

```
ConditionalExpression[(-s)^-k Gamma[k], Re[s] < 0 && Re[k] > 0]
```

```
Integrate[ Log[x]^z, {x, 1, n}]
```

```
ConditionalExpression[(-z Gamma[z] + Gamma[1 + z, -Log[n]]) (-Log[n])^-z Log[n]^z, Re[z] > -1]
```

```
Plot[Re[{Log@Log@x, LogIntegral[x]}], {x, -4, 4}]
```




```
FullSimplify@D[-(-s)^-k Gamma[k, -s Log[x]], k]
```

```
(-s)^-k (Gamma[k, -s Log[x]] (Log[-s] - Log[-s Log[x]]) -
   MeijerG[{{}, {1, 1}}, {{0, 0, k}, {}}, -s Log[x]])
```

```
FullSimplify@D[-(-s)^-k Gamma[k, -s x], k]
```

```
(-s)^-k (Gamma[k, -s x] (Log[-s] - Log[-s x]) - MeijerG[{{}, {1, 1}}, {{0, 0, k}, {}}, -s x])
```

```
-Integrate[Log[1 / x]^(z - 1) x^(s - 1), {x, 1, n}]
```

```
ConditionalExpression[-(-1)^z (-s)^-z (-Gamma[z] + Gamma[z, -s Log[n]]), Re[z] > 0 && Log[n] > 0]
```

```
FullSimplify[(-1)^z (-s)^-z] /. z → -4
```

s^4

```
s^-z Gamma[z, 0, -s Log[n]]
```

```
s^-z Gamma[z, 0, -s Log[n]]
```

```
-Integrate[(-Log[x])^(z - 1) x^(s - 1), {x, 1, n}]
```

```
ConditionalExpression[-(-1)^z (-s)^-z (-Gamma[z] + Gamma[z, -s Log[n]]), Re[z] > 0 && Log[n] > 0]
```

```
N[-(-1)^z (-s)^-z (-Gamma[z] + Gamma[z, -s Log[n]]) /. {n → 10, z → 2, s → 2}]
```

$90.3793 - 1.10377 \times 10^{-14}\, i$

```
N[-Integrate[(-Log[x])^(z - 1) x^(s - 1), {x, 1, n}] /. {n → 10, z → 2, s → 2}]
```

$90.3793 - 1.10377 \times 10^{-14}\, i$

```
N[s^-z (Gamma[z, 0, -s Log[n]]) /. {n → 10, z → 2, s → 2}]
```

$90.3793 - 1.10377 \times 10^{-14}\, i$