```
Limit[(a - 1) Sum[ a^k , {k, 0, Infinity}], a → 1]
Integrate[ n^s Log[n], {s, 0, Infinity}]
```

$$-1$$

$$\text{ConditionalExpression}[-1, \text{Re}[\text{Log}[n]] < 0]$$

```
Limit[(a - 1) Sum[ a^(-k) , {k, 0, Infinity}], a → 1]
Integrate[ n^-s Log[n], {s, 0, Infinity}]
```

$$1$$

$$\text{ConditionalExpression}[1, \text{Re}[\text{Log}[n]] > 0]$$

```
Limit[(a - 1) Sum[ a^(2 k) , {k, 0, Infinity}], a → 1]
Integrate[ n^(2 s) Log[n], {s, 0, Infinity}]
```

$$-\frac{1}{2}$$

```
Limit[(a - 1) Sum[ a^(3 k) , {k, 0, Infinity}], a → 1]
Integrate[ n^(3 s) Log[n], {s, 0, Infinity}]
```

$$-\frac{1}{3}$$

$$\text{ConditionalExpression}\left[-\frac{1}{3}, \text{Re}[\text{Log}[n]] < 0\right]$$

```
Limit[(a - 1) Sum[ a^(c k) , {k, 0, Infinity}], a → 1]
Integrate[ n^(c s) Log[n], {s, 0, Infinity}]
```

$$-\frac{1}{c}$$

$$\text{ConditionalExpression}\left[-\frac{1}{c}, \text{Re}[c\ \text{Log}[n]] < 0\right]$$

```
(-1 + n^c)/c /. c → 2
```

$$\frac{1}{2}\left(-1 + n^2\right)$$

```
Limit[ (a - 1) Sum[ 1, {k, 0, Infinity}], a → 1]
Integrate[ Log[n], {s, 0, Infinity}]
```

Sum::div : Sum does not converge. ≫

0

∞ Log[n]

```
Limit[ (a - 1)^2 Sum[k , {k, 0, Infinity}], a → 1]
Integrate[ s Log[n]^2, {s, 0, Infinity}]
```

Sum::div : Sum does not converge. ≫

0

Integrate::idiv : Integral of s does not converge on {0, ∞}. ≫

$$\int_0^\infty s \, \text{Log}[n]^2 \, ds$$

```
Limit[ (a - 1) Sum[ a^k, {k, 0, Infinity}], a → 1]
Integrate[ n^s Log[n], {s, 0, Infinity}]
```

-1

ConditionalExpression[-1, Re[Log[n]] < 0]

```
Limit[ (a - 1)^2 Sum[k a^k , {k, 0, Infinity}], a → 1]
Integrate[ n^s s Log[n]^2, {s, 0, Infinity}]
```

1

```
Limit[ (a - 1)^3 Sum[k^2 a^k , {k, 0, Infinity}], a → 1]
Integrate[ n^s s^2 Log[n]^3, {s, 0, Infinity}]
```

-2

ConditionalExpression[-2, Re[Log[n]] < 0]

```
Limit[ (a - 1)^4 Sum[k^3 a^k , {k, 0, Infinity}], a → 1]
Expand[Integrate[ n^s s^3 Log[n]^4, {s, 0, Infinity}]]
```

6

ConditionalExpression[6, Re[Log[n]] < 0]

```
Limit[ (a - 1)^5 Sum[k^4 a^k , {k, 0, Infinity}], a → 1]
Expand[Integrate[ n^s s^4 Log[n]^5, {s, 0, Infinity}]]
```

$$-24$$

```
ConditionalExpression[-24, Re[Log[n]] < 0]
```

```
Limit[ (a - 1)^m Sum[k^(m - 1) a^k , {k, 0, Infinity}], a → 1]
Integrate[ n^s s^(m - 1) Log[n]^m, {s, 0, Infinity}]
```

```
Limit[(-1 + a)^m HurwitzLerchPhi[a, 1 - m, 0], a → 1]
```

```
ConditionalExpression[Gamma[m] (-Log[n])^-m Log[n]^m, Re[Log[n]] < 0 && Re[m] > 0]
```

```
Limit[ (-1)^s (a - 1)^s Sum[k^(s - 1) a^k , {k, 0, Infinity}] /. s → 11 / 2, a → 1]
```

$$\frac{945\sqrt{\pi}}{32}$$

```
Gamma[11 / 2]
```

$$\frac{945\sqrt{\pi}}{32}$$

```
Integrate[ n^s s^(m - 1) Log[n]^m, {s, 0, Infinity}] /. {n → 3 I, m → 2}
```

```
Undefined
```

```
Limit[ (a - 1)^s Sum[k^(s - 1) a^(-k) , {k, 0, Infinity}] /. s → 5, a → 1]
```

$$24$$

```
Limit[ (a - 1)^m Sum[k^(m - 1) a^-k , {k, 0, Infinity}], a → 1]
Integrate[ n^-s s^(m - 1) Log[n]^m, {s, 0, Infinity}]
```

```
Limit[(-1 + a)^m HurwitzLerchPhi[1/a, 1 - m, 0], a → 1]
```

```
ConditionalExpression[Gamma[m], Re[Log[n]] > 0 && Re[m] > 0]
```

```
Limit[(-1 + a)^s HurwitzLerchPhi[1/a, 1 - s, 0] /. s → 3 / 2, a → 1]
```

$$\frac{\sqrt{\pi}}{2}$$

```
Limit[ (a - 1)^2 Sum[k a^(2 k) , {k, 0, Infinity}], a → 1]
Integrate[ n^(2 s) s Log[n]^2, {s, 0, Infinity}]
```

$$\frac{1}{4}$$

```
ConditionalExpression[1/4, Re[Log[n]] < 0]
```

```
Limit[ (a - 1)^0 Sum[k^-1 a^k , {k, 0, Infinity}], a → 1]
```

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

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

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

General::stop : Further output of Power::infy will be suppressed during this calculation. ≫

$$\text{Limit}\left[\sum_{k=0}^{\infty} \frac{a^k}{k},\ a \to 1\right]$$

```
Limit[ (a - 1)^(4) Sum[k^((4) - 1) a^k , {k, 0, Infinity}], a → 1]
Expand[Integrate[ n^s s^(4 - 1) Log[n]^4, {s, 0, Infinity}]]
```

6

```
ConditionalExpression[6, Re[Log[n]] < 0]
```

```
Limit[Integrate[ s^(a - 1) Log[n]^a, {s, 0, Infinity}], a → 2]
```

Integrate::idiv : Integral of s^{-1+a} does not converge on {0, ∞}. ≫

$$\text{Limit}\left[\int_0^{\infty} s^{-1+a}\, \text{Log}[n]^a\, \mathrm{d}s,\ a \to 2\right]$$

```
Limit[Integrate[ n^s s^(a - 1) Log[n]^a, {s, 0, Infinity}], a → 2]
ConditionalExpression[1, Re[Log[n]] < 0]
Limit[Integrate[ n^s s^(a - 1) Log[n]^a, {s, 0, Infinity}], a → c]
ConditionalExpression[Gamma[c] (-Log[n])^-c Log[n]^c, Re[Log[n]] < 0 && Re[c] ≥ 0]

Limit[Integrate[ n^s s^(a - 1) Log[n]^a, {s, 0, Infinity}], a → 4]
ConditionalExpression[6, Re[Log[n]] < 0]
Limit[Integrate[ n^s s^(a - 1) Log[n]^a, {s, 0, Infinity}], a → 1]
ConditionalExpression[-1, Re[Log[n]] < 0]
Integrate[ n^s s^(a - 1) Log[n]^a, {s, 0, Infinity}]
ConditionalExpression[Gamma[a] (-Log[n])^-a Log[n]^a, Re[Log[n]] < 0 && Re[a] > 0]
Integrate[ n^s s^(a - 1) Log[n]^a, {s, 0, Infinity}]
ConditionalExpression[Gamma[a] (-Log[n])^-a Log[n]^a, Re[Log[n]] < 0 && Re[a] > 0]
```

```
Limit[Integrate[ n^s s^(a - 1) Log[n]^a, {s, 0, Infinity}], a → c]
```

$\text{ConditionalExpression}[\text{Gamma}[c]\ (-\text{Log}[n])^{-c}\ \text{Log}[n]^c,\ \text{Re}[\text{Log}[n]] < 0\ \&\&\ \text{Re}[c] \geq 0]$

```
N[Integrate[ 100^s s^(7 / 4 - 1) Log[100]^(7 / 4), {s, 0, Infinity}]]
```

Integrate::idiv : Integral of $100^s s^{3/4}$ does not converge on {0, ∞}. ≫

NIntegrate::inumri :
The integrand $100^s s^{3/4}$ Log[100]$^{7/4}$ has evaluated to Overflow, Indeterminate, or Infinity for all sampling points in the region with boundaries $\{\{0., 4.64782 \times 10^{14}\}\}$. ≫

NIntegrate::inumri :
The integrand $100^s s^{3/4}$ Log[100]$^{7/4}$ has evaluated to Overflow, Indeterminate, or Infinity for all sampling points in the region with boundaries $\{\{0., 4.64782 \times 10^{14}\}\}$. ≫

NIntegrate::inumri :
The integrand $100^s s^{3/4}$ Log[100]$^{7/4}$ has evaluated to Overflow, Indeterminate, or Infinity for all sampling points in the region with boundaries $\{\{0., 4.64782 \times 10^{14}\}\}$. ≫

General::stop : Further output of NIntegrate::inumri will be suppressed during this calculation. ≫

$\text{NIntegrate}\left[100^s\ s^{3/4}\ \text{Log}[100]^{7/4},\ \{s, 0, \infty\}\right]$

```
Abs[N[Gamma[7 / 4, 0, -Log[100]]]]
```

259.651

```
Integrate[ Log[1 / t]^(k - 1), {t, 0, Infinity}]
```

Integrate::idiv : Integral of $(-\text{Log}[t])^{-1+k}$ does not converge on {0, ∞}. ≫

$$\int_0^\infty \text{Log}\left[\frac{1}{t}\right]^{-1+k} dt$$