```
Integrate[1, {j, 0, x}]
Integrate[1, {j, 0, x}, {k, 0, j}]
Integrate[1, {j, 0, x}, {k, 0, j}, {l, 0, k}]
Integrate[1, {j, 0, x}, {k, 0, j}, {l, 0, k}, {m, 0, l}]
```

$$x$$

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

$$\frac{x^3}{6}$$

$$\frac{x^4}{24}$$

```
Integrate[1, {j, 1, x}]
Integrate[1, {j, 1, x}, {k, 1, j}]
Integrate[1, {j, 1, x}, {k, 1, j}, {l, 1, k}]
Integrate[1, {j, 1, x}, {k, 1, j}, {l, 1, k}, {m, 1, l}]
```

$$-1 + x$$

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

$$\frac{1}{6} (-1 + x)^3$$

$$\frac{1}{24} (-1 + x)^4$$

```
Integrate[1 / j, {j, 1, x}]
Integrate[1 / (j k), {j, 1, x}, {k, 1, x / j}]
Integrate[1 / (j k l), {j, 1, x}, {k, 1, x / j}, {l, 1, x / (j k)}]
Integrate[1 / (j k l m), {j, 1, x}, {k, 1, x / j}, {l, 1, x / (j k)}, {m, 1, x / (j k l)}]
```

$$\text{ConditionalExpression}[\text{Log}[x], \text{Re}[x] \geq 0 \,||\, x \notin \text{Reals}]$$

$$\text{ConditionalExpression}\left[\frac{\text{Log}[x]^2}{2}, \text{Re}[x] \geq 0 \,||\, x \notin \text{Reals}\right]$$

$$\text{ConditionalExpression}\left[\frac{\text{Log}[x]^3}{6}, \text{Re}[x] \geq 0 \,||\, x \notin \text{Reals}\right]$$

$$\text{ConditionalExpression}\left[\frac{\text{Log}[x]^4}{24}, \text{Re}[x] \geq 0 \,||\, x \notin \text{Reals}\right]$$

```
Expand[Integrate[1, {j, 1, x}]]
Expand[Integrate[1, {j, 1, x}, {k, 1, x / j}]]
Expand[Integrate[1, {j, 1, x}, {k, 1, x / j}, {l, 1, x / (j k)}]]
Expand[Integrate[1, {j, 1, x}, {k, 1, x / j}, {l, 1, x / (j k)}, {m, 1, x / (j k l)}]]
```

$$-1+x$$

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

$$\text{ConditionalExpression}\left[-1+x-x\,\text{Log}[x]+\frac{1}{2}x\,\text{Log}[x]^2,\ \text{Re}[x]\geq 0\ ||\ x\notin \text{Reals}\right]$$

$$\text{ConditionalExpression}\left[1-x+x\,\text{Log}[x]-\frac{1}{2}x\,\text{Log}[x]^2+\frac{1}{6}x\,\text{Log}[x]^3,\ \text{Re}[x]\geq 0\ ||\ x\notin \text{Reals}\right]$$

```
Integrate[1 / j, {j, 1, x}]
Integrate[1 / (j k), {j, 1, x}, {k, 1, j}]
Integrate[1 / (j k l), {j, 1, x}, {k, 1, j}, {l, 1, k}]
Integrate[1 / (j k l m), {j, 1, x}, {k, 1, j}, {l, 1, k}, {m, 1, l}]
```

```
ConditionalExpression[Log[x], Re[x] ≥ 0 || x ∉ Reals]
```

$$\text{ConditionalExpression}\left[\frac{\text{Log}[x]^2}{2},\ \text{Re}[x]\geq 0\ ||\ x\notin \text{Reals}\right]$$

$$\text{ConditionalExpression}\left[\frac{\text{Log}[x]^3}{6},\ \text{Re}[x]\geq 0\ ||\ x\notin \text{Reals}\right]$$

$$\text{ConditionalExpression}\left[\frac{\text{Log}[x]^4}{24},\ \text{Re}[x]\geq 0\ ||\ x\notin \text{Reals}\right]$$

```
Sum[1 / j, {j, 1, x}]
Sum[1 / (j k), {j, 1, x}, {k, 1, j}]
Sum[1 / (j k l), {j, 1, x}, {k, 1, j}, {l, 1, k}]
Sum[1 / (j k l m), {j, 1, x}, {k, 1, j}, {l, 1, k}, {m, 1, l}]
```

```
HarmonicNumber[x]
```

$$\frac{1}{6}\left(\pi^2+3\,\text{HarmonicNumber}[x]^2-3\,\text{HarmonicNumber}[x,2]-6\,\text{PolyGamma}[1,1+x]\right)$$

$$\sum_{j=1}^{x}\sum_{k=1}^{j}\sum_{l=1}^{k}\frac{1}{j\,k\,l}$$

$$\sum_{j=1}^{x}\sum_{k=1}^{j}\sum_{l=1}^{k}\sum_{m=1}^{l}\frac{1}{j\,k\,l\,m}$$

```
Sum[1, {j, 2, x}]
Sum[1, {j, 2, x}, {k, 2, j}]
Sum[1, {j, 2, x}, {k, 2, j}, {l, 2, k}]
Sum[1, {j, 2, x}, {k, 2, j}, {l, 2, k}, {m, 2, l}]
```

$$-1+x$$

$$\frac{1}{2}(-1+x)\,x$$

$$\frac{1}{6}(-1+x)\,x\,(1+x)$$

$$\frac{1}{24}(-1+x)\,x\,(1+x)\,(2+x)$$

```
Sum[1, {j, 1, x}]
Sum[1, {j, 1, x}, {k, 1, j}]
Sum[1, {j, 1, x}, {k, 1, j}, {l, 1, k}]
Sum[1, {j, 1, x}, {k, 1, j}, {l, 1, k}, {m, 1, l}]
```

$$x$$

$$\frac{1}{2}x\,(1+x)$$

$$\frac{1}{6}x\,(1+x)\,(2+x)$$

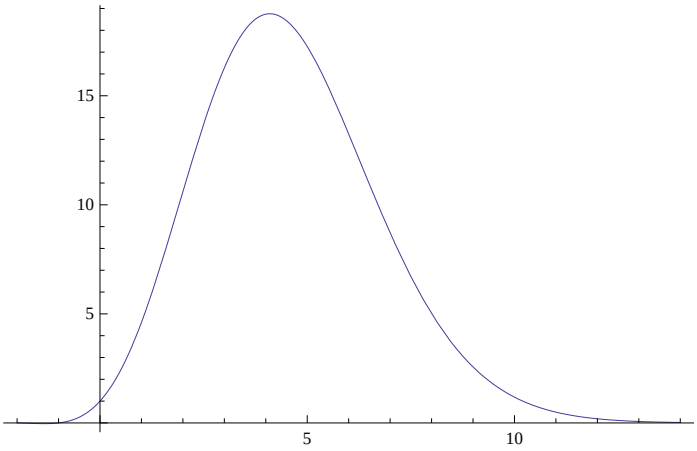
$$\frac{1}{24}x\,(1+x)\,(2+x)\,(3+x)$$

```
Expand[1/6 x (1 + x) (2 + x)]
```

$$\frac{x}{3}+\frac{x^2}{2}+\frac{x^3}{6}$$

```
Sum[j^(-1), {j, 1, n}]
HarmonicNumber[n]
```

```
Plot[ Log[100]^k / Gamma[k + 1], {k, -2, 14}]
```




```
FullSimplify[Log[n]^k / Gamma[k + 1]]
```

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

```
FullSimplify[(n - 1)^k / Gamma[k + 1]]
```

$$\frac{(-1 + n)^k}{\text{Gamma}[1 + k]}$$

```
FullSimplify[(n)^k / Gamma[k + 1]]
```

$$\frac{n^k}{\text{Gamma}[1 + k]}$$