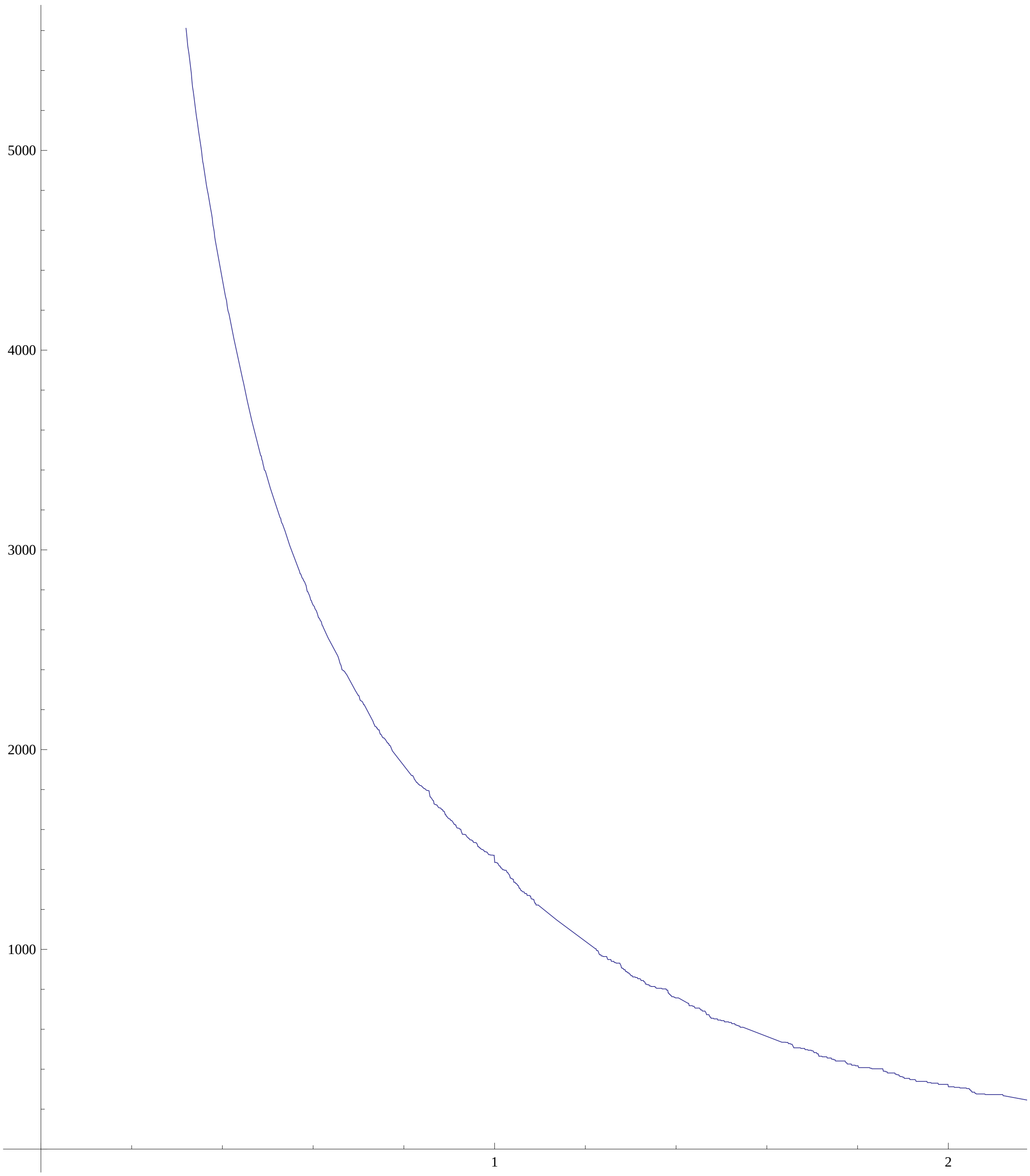
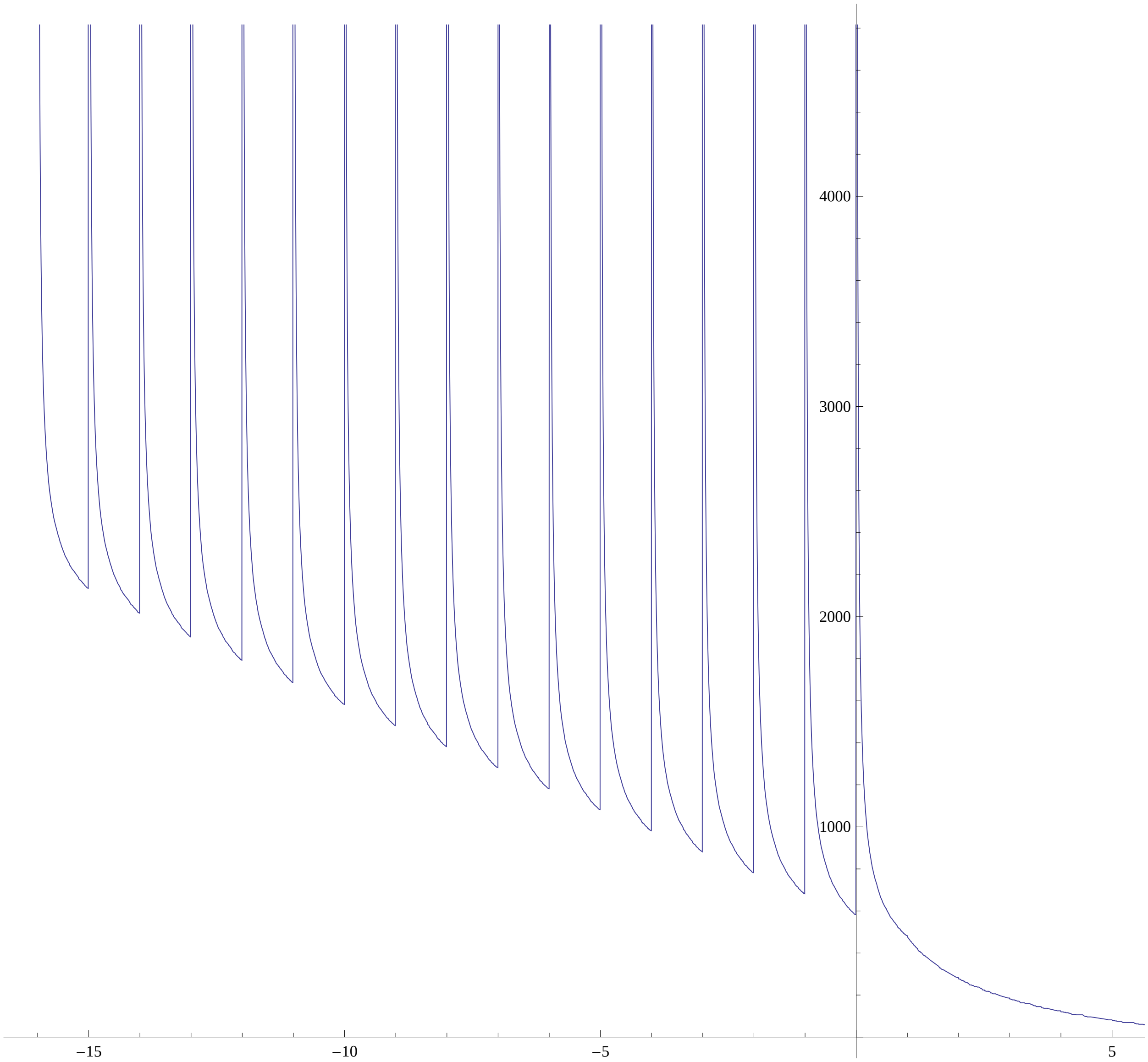
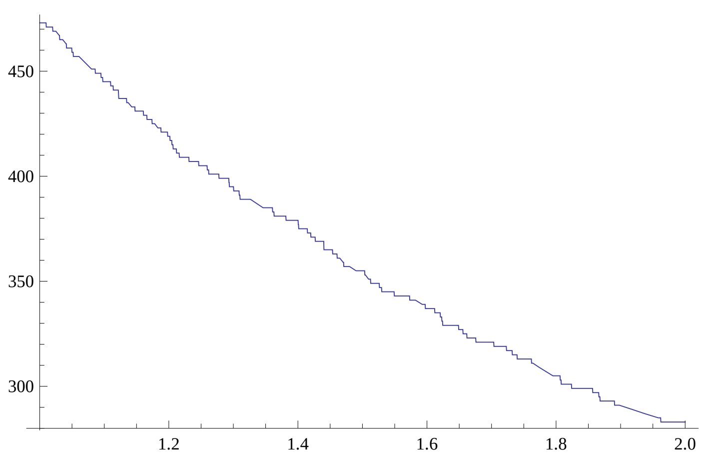
```
ClearAll["Global`*"]

f[n_, k_, a_] := f[n, k, a] = Sum[ f[n / (a + j), k - 1, a], {j, 0, Floor[n - a]}];
f[n_, 0, a_] := 1

Plot[f[100, 3, a], {a, 0, 4}]
```



```
Plot[f[100, 2, a], {a, -16, 16}]
```




```
Plot[f[100, 2, a], {a, 1, 2}]
```



```
f[100, 2, 11]
```

0

```
Dhyp[n_, k_, a_] :=
 Sum[Binomial[k, j] Dhyp[Floor[n / (m^(k - j))], j, m + 1], {m, a, n^(1 / k)}, {j, 0, k - 1}]
Dhyp[n_, 1, a_] := Floor[n] - a + 1; Dhyp[n_, 0, a_] := 1
```

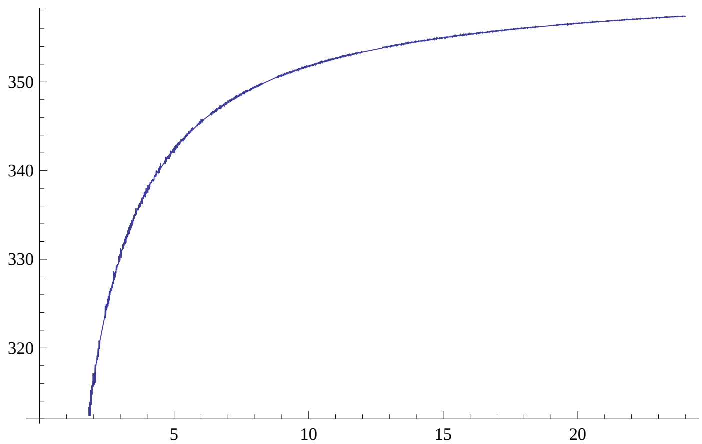
```
24^-2 f[100 × 24^2, 3, 25]
```

$\frac{4493}{144}$

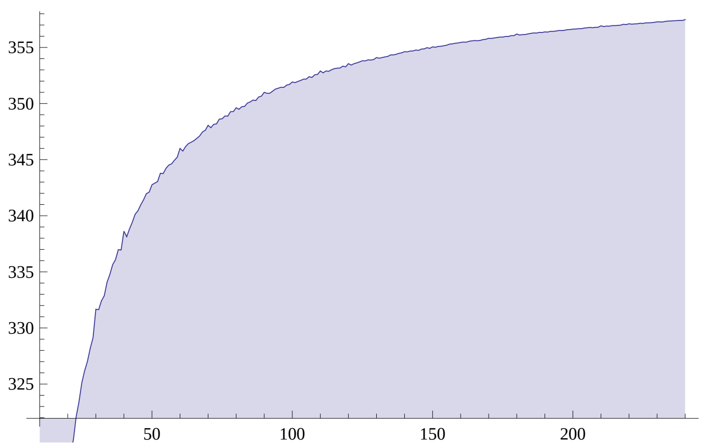
```
24^-2 Dhyp[100 × 24^2, 3, 25]
```

$\frac{4493}{144}$

```
Plot[n^-2 Dhyp[100 n^2, 2, n + 1], {n, 0, 24}]
```




```
DiscretePlot[(n * .1)^-2 f[100 (n * .1)^2, 2, (n * .1) + 1], {n, 10, 240}]
```




```
N[Gamma[2, 0, -Log[100]] / Gamma[2]]
```

$361.517 - 4.41506 \times 10^{-14}\, i$

```
f[100, 2, k]
```

$$\sum_{j=0}^{100+\text{Floor}[-k]} \left(1 + \text{Floor}\left[\frac{100 - j\,k - k^2}{j + k}\right]\right)$$

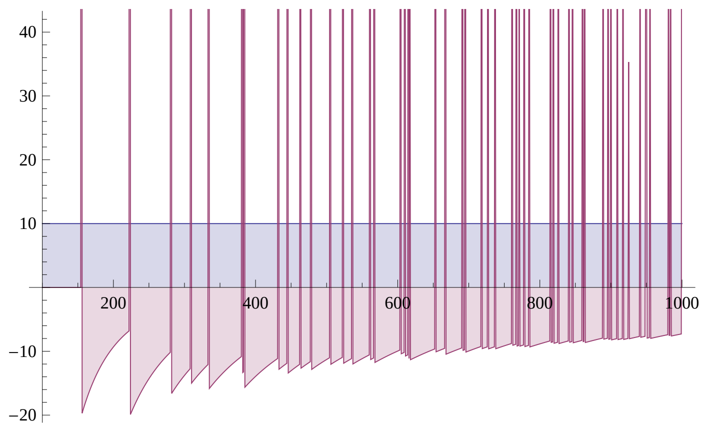
```
f2[k_] := k^-2 f[10 k^2, 2, k + 1]
f2'[4]
```

General::ivar : 4 is not a valid variable. ≫

$$-\frac{2351}{32} + \frac{\partial_4 2351}{16}$$

General::ivar : 3 is not a valid variable. ≫

```
DiscretePlot[ {10, (f2[n * .003] - f2[(n - 1) * .003]) / .003}, {n, 100, 1000}]
```




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

$$\left(\frac{s}{-1 + s}\right)^{z}$$

```
Sum[(-1) ^ (k - 1) / k 1 / (s - 1) ^k, {k, 1, Infinity}]
```

$$\text{Log}\left[\frac{s}{-1 + s}\right]$$

```
f[n_, z_] := Sum[(-1) ^k Binomial[z, k] (1 - Gamma[ k, -Log[n]] / Gamma[k]), {k, 0, Infinity}]
N[f[100, 2]]
```

560.517

```
f[100, 3, 2]
```

324

```
hh[s_, x_] := x^ (s - 1) Zeta[ s, x + 1]
D[hh[s, x], x]
```

$$\text{h2}[s\_,\ x\_] := (-1 + s)\, x^{-2+s}\, \text{Zeta}[s, 1 + x] - s\, x^{-1+s}\, \text{Zeta}[1 + s, 1 + x]$$

```
h3[s_] := (1 / (s - 1)) - Integrate[ h2[s, x], {x, 1, Infinity}]
```

```
h3[3]
```

$-1 + \text{Zeta}[3]$

```
h3a[s_] :=
 (1 / (s - 1)) - Integrate[(-1 + s) x^(-2+s) Zeta[s, 1 + x] - s x^(-1+s) Zeta[1 + s, 1 + x], {x, 1, Infinity}]
```

```
h3a[s]
```

$$\frac{1}{-1+s} - \int_1^\infty \left((-1+s)\, x^{-2+s}\, \text{Zeta}[s, 1+x] - s\, x^{-1+s}\, \text{Zeta}[1+s, 1+x]\right) dx$$

```
Integrate[(-1 + s) x^(-2+s) Zeta[s, 1 + x], {x, 1, Infinity}]
```

$$\int_1^\infty (-1+s)\, x^{-2+s}\, \text{Zeta}[s, 1+x]\, dx$$

```
Integrate[-s x^(-1+s) Zeta[1 + s, 1 + x], {x, 1, Infinity}]
```

$$\int_1^\infty -s\, x^{-1+s}\, \text{Zeta}[1+s, 1+x]\, dx$$

```
hi[s_, z_, x_] := x^(z (s - 1)) Zeta[ s, x + 1]^z
```

```
D[hi[s, z, x], x]
```

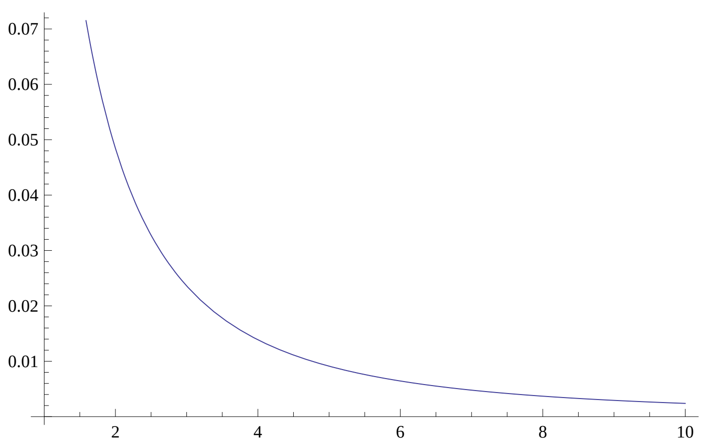
$$(-1+s)\, x^{-1+(-1+s)\, z}\, z\, \text{Zeta}[s, 1+x]^z - s\, x^{(-1+s)\, z}\, z\, \text{Zeta}[s, 1+x]^{-1+z}\, \text{Zeta}[1+s, 1+x]$$

```
Sum[ (-1)^(z - 1) / z
  ((-1 + s) x^(-1+(-1+s) z) z Zeta[s, 1 + x]^z - s x^((-1+s) z) z Zeta[s, 1 + x]^(-1+z) Zeta[1 + s, 1 + x]), {z,
  1, Infinity}]
```

$$-\frac{x^{-1+s}\, (\text{Zeta}[s, 1+x] - s\, \text{Zeta}[s, 1+x] + s\, x\, \text{Zeta}[1+s, 1+x])}{x + x^s\, \text{Zeta}[s, 1+x]}$$

```
dlog[s_, x_] := - (x^(-1+s) (Zeta[s, 1 + x] - s Zeta[s, 1 + x] + s x Zeta[1 + s, 1 + x])) / (x + x^s Zeta[s, 1 + x])
```

```
Plot[ dlog[ 2, x], {x, 1, 10}]
```




```
Residue[ Zeta[s]^z / z^2, {z, -2}]
```

0

```
f[100, 2, 2]
```

```
283
```

```
f[100, 2, 3]
```

```
186
```

```
f[100, 2, 3] + 2 f[100 / 2, 1, 3] + f[100 / 4, 0, 3]
```

```
283
```

```
tt[a_] := f[100, 2, a + 1] + 2 f[100 / a, 1, a + 1] + f[100 / a^2, 0, a + 1]
```

```
f[n_, k_, a_] := f[n, k, a] = Sum[ f[n / (a + j), k - 1, a], {j, 0, Floor[n - a]}];
f[n_, 0, a_] := 1
tt[n_, k_, a_] := Sum[Binomial[k, j] f[n / a^j, k - j, a + 1], {j, 0, k}]
ttb[n_, k_, a_] := Sum[ (-1) ^j Binomial[k, j] f[n / (a - 1) ^j, k - j, a - 1], {j, 0, k}]
```

```
tt[231, 4, 2.5]
```

```
296
```

```
ttb[231, 4, 2.5]
```

```
296
```

```
f[231, 4, 2.5]
```

```
296
```

```
Limit[f[231, 4, z], z → 0]
```

```
$Aborted
```