```
CoefficientList[Series[(x + 1)^(1 / 15), {x, 0, 16}], x]
```

$$\left\{1, \frac{1}{15}, -\frac{7}{225}, \frac{203}{10\,125}, -\frac{2233}{151\,875}, \frac{131\,747}{11\,390\,625}, -\frac{4\,874\,639}{512\,578\,125}, \frac{61\,977\,553}{7\,688\,671\,875}, -\frac{805\,708\,189}{115\,330\,078\,125}, \frac{95\,879\,274\,491}{15\,569\,560\,546\,875}, -\frac{6\,423\,911\,390\,897}{1\,167\,717\,041\,015\,625}, \frac{87\,014\,799\,749\,423}{17\,515\,755\,615\,234\,375}, -\frac{3\,567\,606\,789\,726\,343}{788\,209\,002\,685\,546\,875}, \frac{49\,123\,201\,181\,616\,569}{11\,823\,135\,040\,283\,203\,125}, -\frac{680\,707\,216\,373\,829\,599}{177\,347\,025\,604\,248\,046\,875}, \frac{142\,267\,808\,222\,130\,386\,191}{39\,903\,080\,760\,955\,810\,546\,875}, -\frac{1\,991\,749\,315\,109\,825\,406\,674}{598\,546\,211\,414\,337\,158\,203\,125}\right\}$$

```
CoefficientList[Series[(x + 1)^(-1 / 15), {x, 0, 16}], x]
```

$$\left\{1, -\frac{1}{15}, \frac{8}{225}, -\frac{248}{10\,125}, \frac{2852}{151\,875}, -\frac{173\,972}{11\,390\,625}, \frac{6\,610\,936}{512\,578\,125}, -\frac{85\,942\,168}{7\,688\,671\,875}, \frac{1\,138\,733\,726}{115\,330\,078\,125}, -\frac{137\,786\,780\,846}{15\,569\,560\,546\,875}, \frac{9\,369\,501\,097\,528}{1\,167\,717\,041\,015\,625}, -\frac{128\,617\,696\,884\,248}{17\,515\,755\,615\,234\,375}, \frac{5\,337\,634\,420\,696\,292}{788\,209\,002\,685\,546\,875}, -\frac{74\,316\,294\,626\,617\,604}{11\,823\,135\,040\,283\,203\,125}, \frac{1\,040\,428\,124\,772\,646\,456}{177\,347\,025\,604\,248\,046\,875}, -\frac{219\,530\,334\,327\,028\,402\,216}{39\,903\,080\,760\,955\,810\,546\,875}, \frac{3\,100\,865\,972\,369\,276\,181\,301}{598\,546\,211\,414\,337\,158\,203\,125}\right\}$$

```
CoefficientList[Series[(x + 1)^(-1 / 2), {x, 0, 16}], x]
```

$$\left\{1, -\frac{1}{2}, \frac{3}{8}, -\frac{5}{16}, \frac{35}{128}, -\frac{63}{256}, \frac{231}{1024}, -\frac{429}{2048}, \frac{6435}{32\,768}, -\frac{12\,155}{65\,536}, \frac{46\,189}{262\,144}, -\frac{88\,179}{524\,288}, \frac{676\,039}{4\,194\,304}, -\frac{1\,300\,075}{8\,388\,608}, \frac{5\,014\,575}{33\,554\,432}, -\frac{9\,694\,845}{67\,108\,864}, \frac{300\,540\,195}{2\,147\,483\,648}\right\}$$

```
CoefficientList[Series[(x + 1)^(1 / 2), {x, 0, 16}], x]
```

$$\left\{1, \frac{1}{2}, -\frac{1}{8}, \frac{1}{16}, -\frac{5}{128}, \frac{7}{256}, -\frac{21}{1024}, \frac{33}{2048}, -\frac{429}{32\,768}, \frac{715}{65\,536}, -\frac{2431}{262\,144}, \frac{4199}{524\,288}, -\frac{29\,393}{4\,194\,304}, \frac{52\,003}{8\,388\,608}, -\frac{185\,725}{33\,554\,432}, \frac{334\,305}{67\,108\,864}, -\frac{9\,694\,845}{2\,147\,483\,648}\right\}$$

```
co := CoefficientList[Series[(x + 1)^a, {x, 0, 16}], x]
```

```
Table[ co[[n]], {n, 0, 16}] // TableForm
```

List
1
a
$\frac{1}{2}(-1+a)\,a$
$\frac{1}{6}(-2+a)(-1+a)\,a$
$\frac{1}{24}(-3+a)(-2+a)(-1+a)\,a$
$\frac{1}{120}(-4+a)(-3+a)(-2+a)(-1+a)\,a$
$\frac{1}{720}(-5+a)(-4+a)(-3+a)(-2+a)(-1+a)\,a$
$\frac{(-6+a)(-5+a)(-4+a)(-3+a)(-2+a)(-1+a)\,a}{5040}$
$\frac{(-7+a)(-6+a)(-5+a)(-4+a)(-3+a)(-2+a)(-1+a)\,a}{40\,320}$
$\frac{(-8+a)(-7+a)(-6+a)(-5+a)(-4+a)(-3+a)(-2+a)(-1+a)\,a}{362\,880}$
$\frac{(-9+a)(-8+a)(-7+a)(-6+a)(-5+a)(-4+a)(-3+a)(-2+a)(-1+a)\,a}{3\,628\,800}$
$\frac{(-10+a)(-9+a)(-8+a)(-7+a)(-6+a)(-5+a)(-4+a)(-3+a)(-2+a)(-1+a)\,a}{39\,916\,800}$
$\frac{(-11+a)(-10+a)(-9+a)(-8+a)(-7+a)(-6+a)(-5+a)(-4+a)(-3+a)(-2+a)(-1+a)\,a}{479\,001\,600}$
$\frac{(-12+a)(-11+a)(-10+a)(-9+a)(-8+a)(-7+a)(-6+a)(-5+a)(-4+a)(-3+a)(-2+a)(-1+a)\,a}{6\,227\,020\,800}$
$\frac{(-13+a)(-12+a)(-11+a)(-10+a)(-9+a)(-8+a)(-7+a)(-6+a)(-5+a)(-4+a)(-3+a)(-2+a)(-1+a)\,a}{87\,178\,291\,200}$
$\frac{(-14+a)(-13+a)(-12+a)(-11+a)(-10+a)(-9+a)(-8+a)(-7+a)(-6+a)(-5+a)(-4+a)(-3+a)(-2+a)(-1+a)\,a}{1\,307\,674\,368\,000}$

```
Pochhammer[a - 4, 5] / 5!
```

$\frac{1}{120}(-4+a)(-3+a)(-2+a)(-1+a)\,a$

```
5!
```

120

```
Gamma[6]
```

120

```
Pw[x_, a_, t_] := Sum[ Gamma[a + 1] / (Gamma[a - k + 1] Gamma[k + 1] ) (x - 1)^k, {k, 0, t}]
```

```
Pw[1.03, .7, 220]
```

1.02091

```
1.03^.7
```

1.02091

```
D2[n_, k_] := Sum[D2[Floor[n / j], k - 1], {j, 2, n}]; D2[n_, 0] := 1
d[n_, z_] := Product[Pochhammer[z, a = p[[2]]] / a!, {p, FI[n]}];
FI[n_] := FactorInteger[n]; FI[1] := {}
DD[n_, k_] := Sum[d[j, k], {j, 1, n}]
```

```
DD[100, 3.7]
```

2787.64

```
DD[100, -3.3]
```

62.6314

```
DD[100, 2.2 + 3.2 I]
```

```
-2014.18 + 106.902 i
```

```
Dw[x_, a_] := Sum[ Gamma[a + 1] / (Gamma[a - k + 1] Gamma[k + 1] ) D2[x, k], {k, 0, Log[2, x]}]
```

```
Dw[100, 3.7]
```

```
2787.64
```

```
Dw[100, -3.3]
```

```
62.6314
```

```
Dw[500, -1.00000000001]
```

```
-6.01483
```

```
22.007322536523986`
```

```
DD[500, -1]
```

```
-6
```

```
D2[100, 3]
```

```
324
```

```
Dw2[x_, a_, t_] :=
 Sum[(-1)^(a - k) Gamma[a + 1] / (Gamma[a - k + 1] Gamma[k + 1] ) DD[x, k], {k, 0, t}]
```

```
Dw2[100, 2.2, 60]
```

```
-11620.1 - 8442.5 i
```

```
CoefficientList[Series[(x + 1)^a, {x, 0, 16}], x]
```

```
{1, 2, 1}
```

```
CoefficientList[Series[(x - 1)^b, {x, 0, 16}], x]
```

$$\left\{(-1)^b,\ -(-1)^b\,b,\ \frac{1}{2}(-1)^b(-1+b)\,b,\ -\frac{1}{6}(-1)^b(-2+b)(-1+b)\,b,\right.$$
$$\frac{1}{24}(-1)^{-4+b}(-3+b)(-2+b)(-1+b)\,b,\ \frac{1}{120}(-1)^{-5+b}(-4+b)(-3+b)(-2+b)(-1+b)\,b,$$
$$\frac{1}{720}(-1)^{-6+b}(-5+b)(-4+b)(-3+b)(-2+b)(-1+b)\,b,$$
$$\frac{(-1)^{-7+b}(-6+b)(-5+b)(-4+b)(-3+b)(-2+b)(-1+b)\,b}{5040},$$
$$\frac{(-1)^{-8+b}(-7+b)(-6+b)(-5+b)(-4+b)(-3+b)(-2+b)(-1+b)\,b}{40\,320},\ \frac{1}{362\,880}$$
$$(-1)^{-9+b}(-8+b)(-7+b)(-6+b)(-5+b)(-4+b)(-3+b)(-2+b)(-1+b)\,b,\ \frac{1}{3\,628\,800}$$
$$(-1)^{-10+b}(-9+b)(-8+b)(-7+b)(-6+b)(-5+b)(-4+b)(-3+b)(-2+b)(-1+b)\,b,\ \frac{1}{39\,916\,800}$$
$$(-1)^{-11+b}(-10+b)(-9+b)(-8+b)(-7+b)(-6+b)(-5+b)(-4+b)(-3+b)(-2+b)(-1+b)\,b,$$
$$\frac{1}{479\,001\,600}(-1)^{-12+b}(-11+b)(-10+b)(-9+b)(-8+b)(-7+b)(-6+b)(-5+b)$$
$$(-4+b)(-3+b)(-2+b)(-1+b)\,b,\ \frac{1}{6\,227\,020\,800}(-1)^{-13+b}(-12+b)(-11+b)$$
$$(-10+b)(-9+b)(-8+b)(-7+b)(-6+b)(-5+b)(-4+b)(-3+b)(-2+b)(-1+b)\,b,$$
$$\frac{1}{87\,178\,291\,200}(-1)^{-14+b}(-13+b)(-12+b)(-11+b)(-10+b)(-9+b)$$
$$(-8+b)(-7+b)(-6+b)(-5+b)(-4+b)(-3+b)(-2+b)(-1+b)\,b,$$
$$\frac{1}{1\,307\,674\,368\,000}(-1)^{-15+b}(-14+b)(-13+b)(-12+b)(-11+b)(-10+b)(-9+b)$$
$$(-8+b)(-7+b)(-6+b)(-5+b)(-4+b)(-3+b)(-2+b)(-1+b)\,b,$$
$$\frac{1}{20\,922\,789\,888\,000}(-1)^{-16+b}(-15+b)(-14+b)(-13+b)(-12+b)(-11+b)(-10+b)$$
$$\left.(-9+b)(-8+b)(-7+b)(-6+b)(-5+b)(-4+b)(-3+b)(-2+b)(-1+b)\,b\right\}$$

```
Pwm[x_, a_, t_] :=
 Sum[ (-1)^(a - k) Gamma[a + 1] / (Gamma[a - k + 1] Gamma[k + 1] ) x^k, {k, 0, t}]
```

```
N[Pwm[4, 1 / 3, 30]]
```

$$-2.07759\times10^{15} - 3.59848\times10^{15}\,i$$

```
4^3.3
```

```
97.0059
```

```
Pw[4, 3.3, 40]
```

$$3.13237\times10^{12}$$

```
CoefficientList[Series[(1 / (x - 1) - 1), {x, 0, 16}], x]
```

```
{-2, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1, -1}
```

```
CoefficientList[Series[(1 / (x + 1) - 1), {x, 0, 16}], x]
```

```
{0, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1, -1, 1}
```

```
CoefficientList[Series[(1 / (x + 1) - 1)^2, {x, 0, 16}], x]
```

```
{0, 0, 1, -2, 3, -4, 5, -6, 7, -8, 9, -10, 11, -12, 13, -14, 15}
```

```
FullSimplify[CoefficientList[Series[(1 / (x - 1) + 1)^b, {x, 0, 16}], x]]
```

$$\left\{(-x)^b \left(1 + b\,x + \frac{1}{2} b\,(1+b)\,x^2 + \frac{1}{6} b\,(1+b)\,(2+b)\,x^3 + \right.\right.$$
$$\frac{1}{24} b\,(1+b)\,(2+b)\,(3+b)\,x^4 + \frac{1}{120} b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,x^5 +$$
$$\frac{1}{720} b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,(5+b)\,x^6 + \frac{b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,(5+b)\,(6+b)\,x^7}{5040} +$$
$$\frac{b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,(5+b)\,(6+b)\,(7+b)\,x^8}{40\,320} +$$
$$\frac{b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,(5+b)\,(6+b)\,(7+b)\,(8+b)\,x^9}{362\,880} + \frac{1}{3\,628\,800}$$
$$b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,(5+b)\,(6+b)\,(7+b)\,(8+b)\,(9+b)\,x^{10} + \frac{1}{39\,916\,800}$$
$$b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,(5+b)\,(6+b)\,(7+b)\,(8+b)\,(9+b)\,(10+b)\,x^{11} + \frac{1}{479\,001\,600}$$
$$b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,(5+b)\,(6+b)\,(7+b)\,(8+b)\,(9+b)\,(10+b)\,(11+b)\,x^{12} +$$
$$\frac{1}{6\,227\,020\,800} b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,(5+b)\,(6+b)\,(7+b)\,(8+b)\,(9+b)\,(10+b)\,(11+b)$$
$$(12+b)\,x^{13} + \frac{1}{87\,178\,291\,200} b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,(5+b)\,(6+b)\,(7+b)\,(8+b)$$
$$(9+b)\,(10+b)\,(11+b)\,(12+b)\,(13+b)\,x^{14} + \frac{1}{1\,307\,674\,368\,000} b\,(1+b)\,(2+b)\,(3+b)$$
$$(4+b)\,(5+b)\,(6+b)\,(7+b)\,(8+b)\,(9+b)\,(10+b)\,(11+b)\,(12+b)\,(13+b)\,(14+b)\,x^{15} +$$
$$\frac{1}{20\,922\,789\,888\,000} b\,(1+b)\,(2+b)\,(3+b)\,(4+b)\,(5+b)\,(6+b)\,(7+b)\,(8+b)$$
$$\left.\left.(9+b)\,(10+b)\,(11+b)\,(12+b)\,(13+b)\,(14+b)\,(15+b)\,x^{16} + O[x]^{17}\right)\right\}$$

```
ClearAll["Global`*"]
Dhyp[n_, k_, a_] :=
 Sum[Binomial[k, j] Dhyp[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
Dwh[x_, a_, s_] :=
 Sum[ N[Gamma[a + 1] / (Gamma[a - k + 1] Gamma[k + 1] ) Dhyp[Floor[x / (s^(a - k))], k, s + 1]],
  {k, 0, Log[s + 1, x]}]
```

```
(Dwh[100, 0.1, 3])
```

```
259.031
```

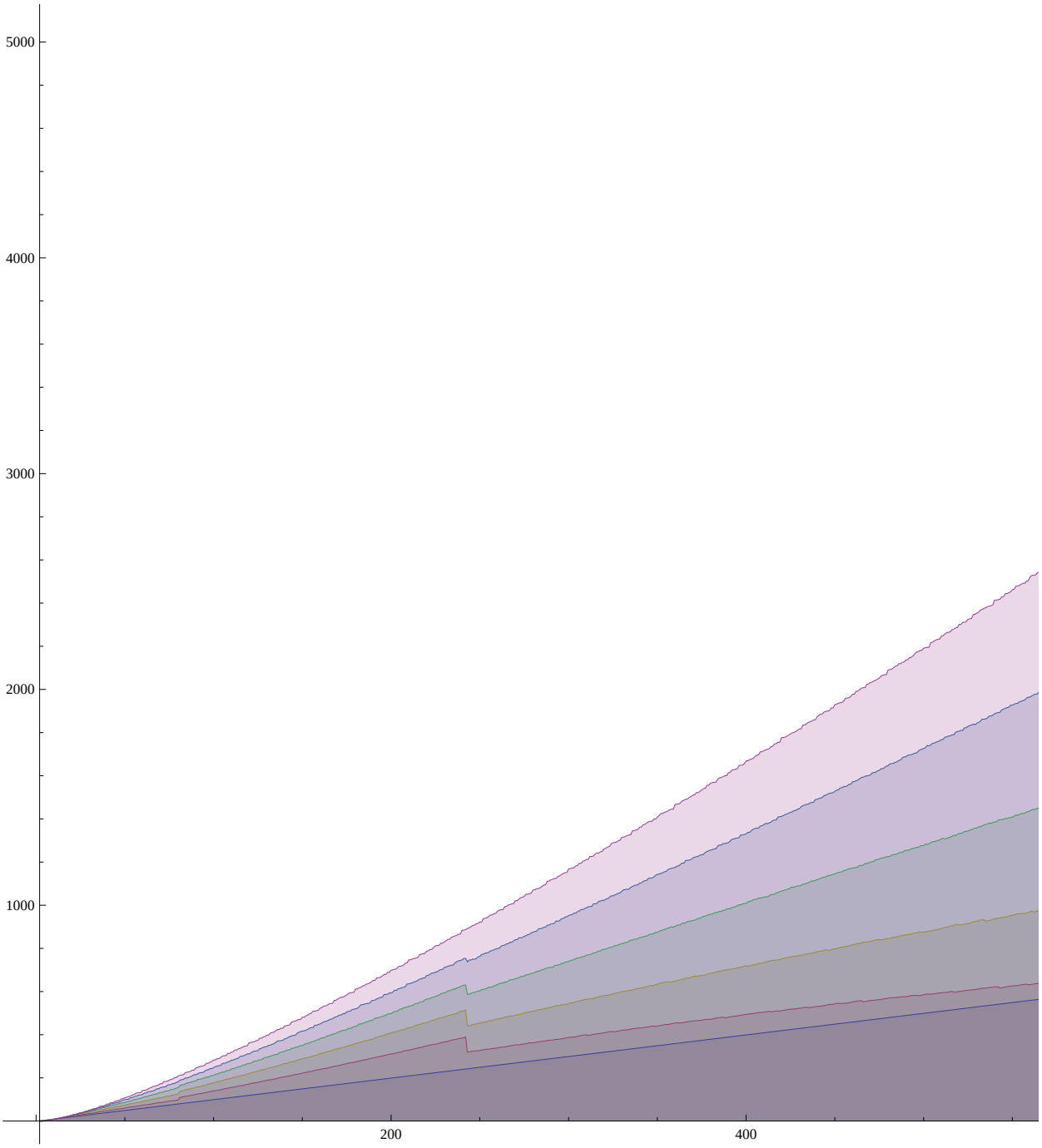
```
Dhyp[1040, 2, 2]
DD[1040, .1]
```

```
5317
```

```
23.6184
```

```
ClearAll["Global`*"]
```

```
DiscretePlot[{Dwh[n, 1, 2], Dwh[n, 1 + .2, 2], Dwh[n, 1 + .4, 2],
  Dwh[n, 1 + .6, 2], Dwh[n, 1 + .8, 2], Dwh[n, 2, 2]}, {n, 2, 1000}]
```



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

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$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. ≫

```
f
```

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

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

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

$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. ≫

```
$Aborted
```

```
Dhyp[10 000, 4, 3]
```

171 994

```
Sum[Gamma[a + 1] / (Gamma[a - k + 1] Gamma[k + 1]) (x - 2)^k, {k, 0, Infinity}]
```

$(-1+x)^a$

```
Sum[Gamma[3.3 + 1] / (Gamma[3.3 - k + 1] Gamma[k + 1]) (x - 2)^k, {k, 0, Infinity}]
```

$1.\,(-1.+x)^{33/10}$