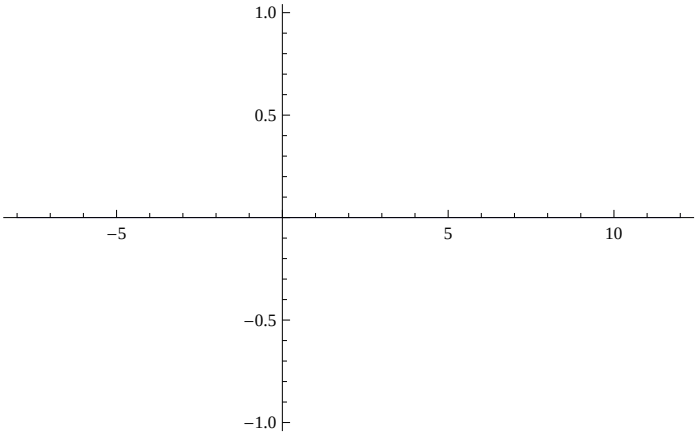
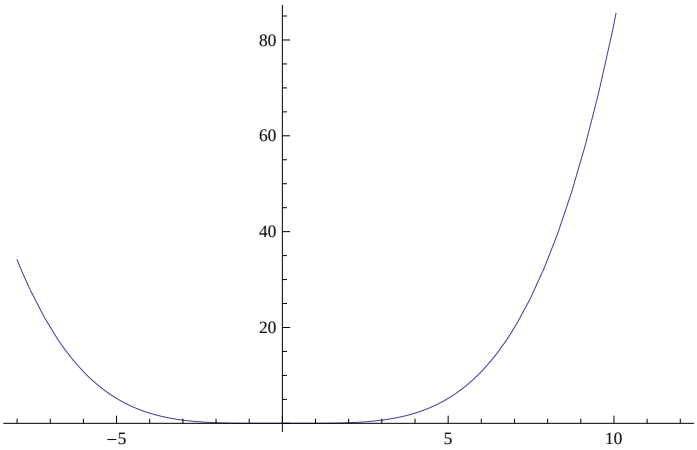
```
ff[s_, a_] := (1 - a^(1 - s)) Zeta[s]
```

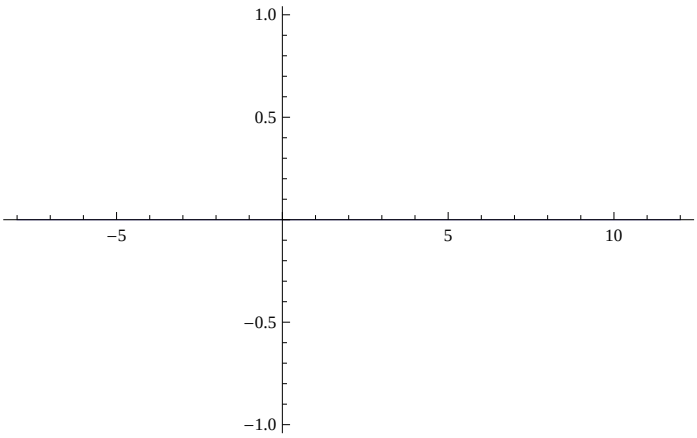
```
Plot[ Abs[ff[-4, k]], {k, -8, 12}]
```



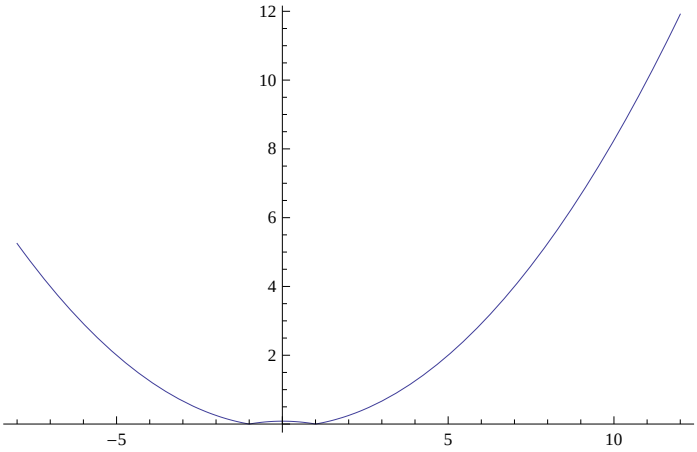

```
Plot[ Abs[ff[-3, k]], {k, -8, 12}]
```



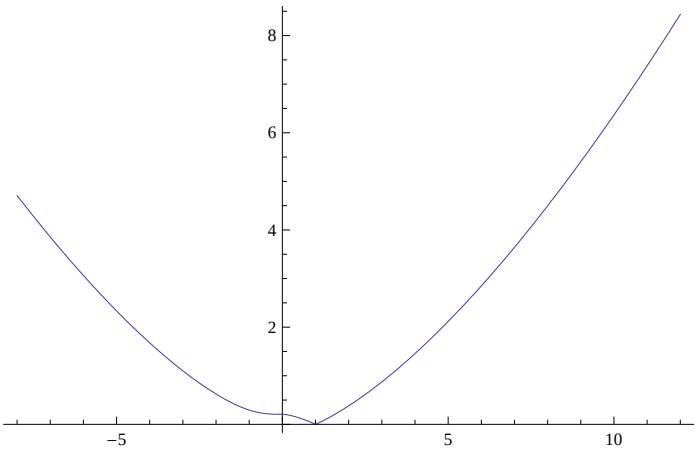

```
Plot[ Abs[ff[-2, k]], {k, -8, 12}]
```



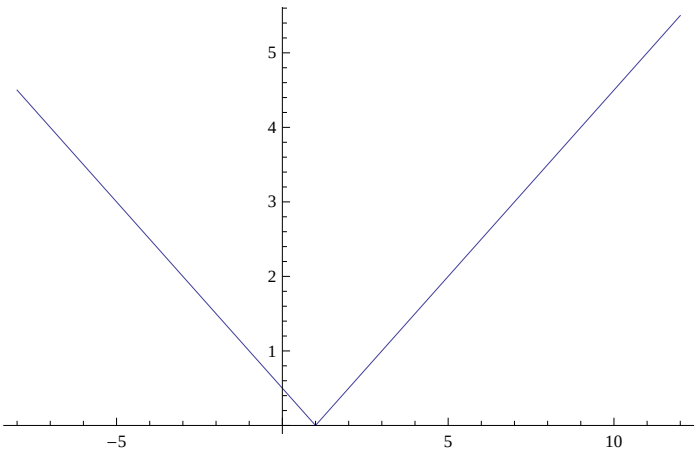
```
Plot[ Abs[ff[-1, k]], {k, -8, 12}]
```



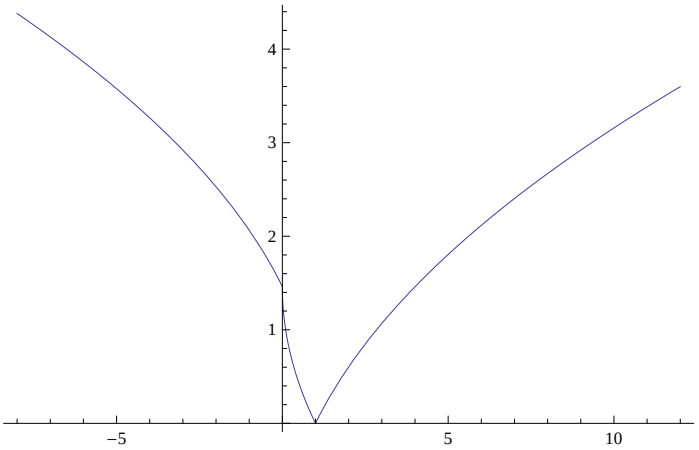

```
Plot[ Abs[ff[-1 / 2, k]], {k, -8, 12}]
```




```
Plot[ Abs[ff[0, k]], {k, -8, 12}]
```



```
Plot[ Abs[ff[1 / 2, k]], {k, -8, 12}]
```



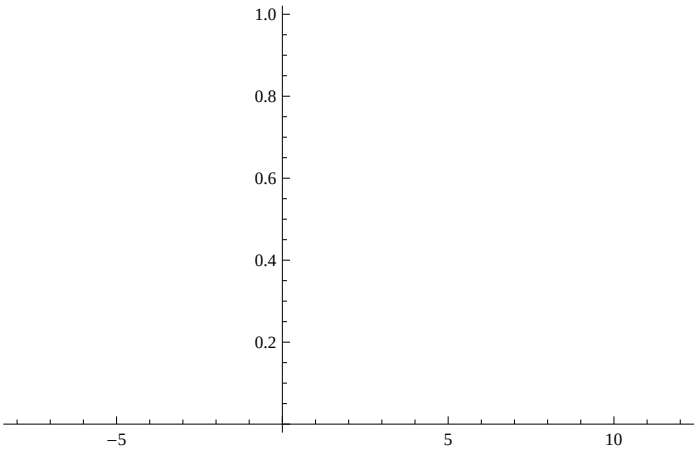

```
Plot[ Abs[ff[1, k]], {k, -8, 12}]
```

Infinity::indet : Indeterminate expression 0. ComplexInfinity encountered. ≫

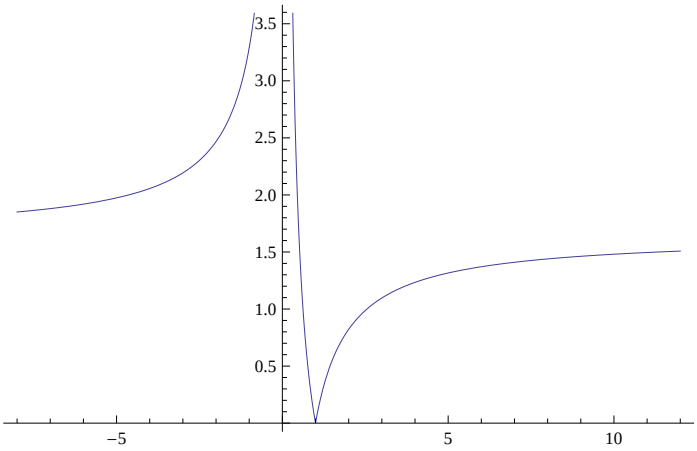
Infinity::indet : Indeterminate expression 0. ComplexInfinity encountered. ≫

Infinity::indet : Indeterminate expression 0. ComplexInfinity encountered. ≫

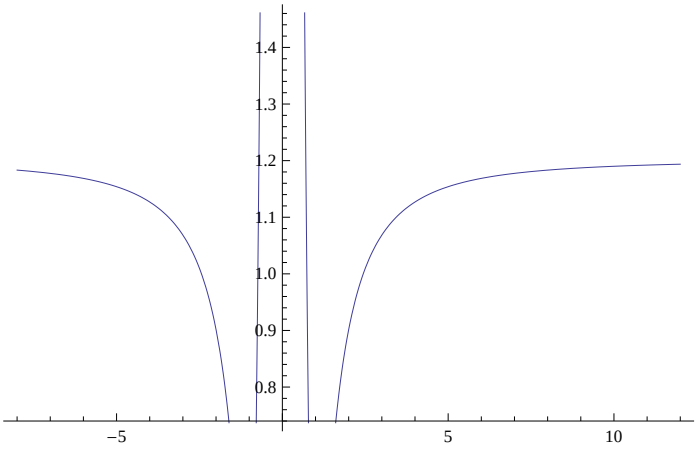
General::stop : Further output of Infinity::indet will be suppressed during this calculation. ≫



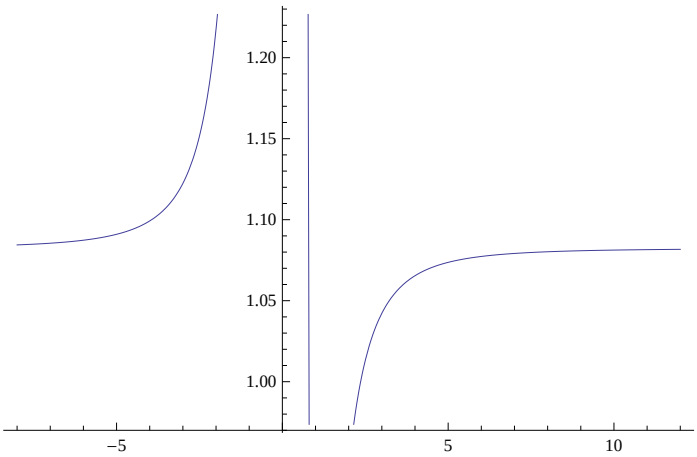
```
Plot[ Abs[ff[2, k]], {k, -8, 12}]
```



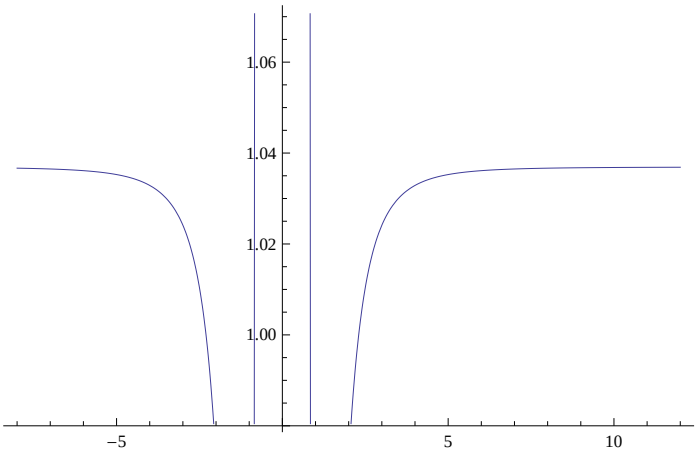

```
Plot[ Abs[ff[3, k]], {k, -8, 12}]
```



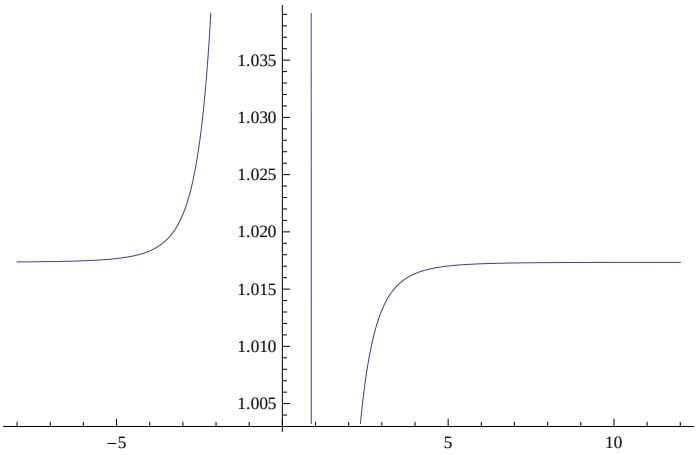

```
Plot[ Abs[ff[4, k]], {k, -8, 12}]
```



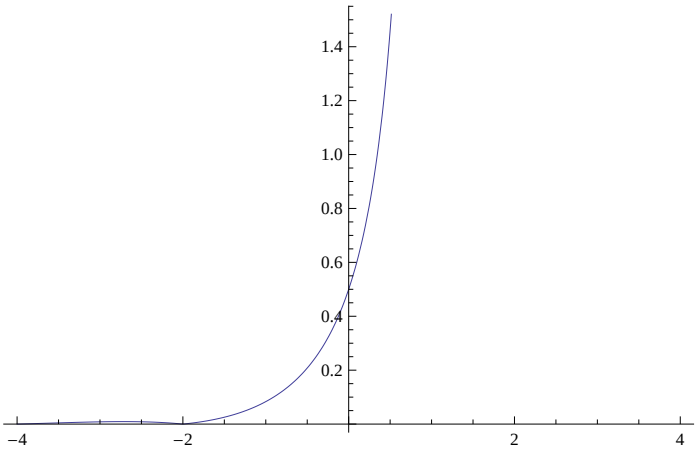
```
Plot[ Abs[ff[5, k]], {k, -8, 12}]
```




```
Plot[ Abs[ff[6, k]], {k, -8, 12}]
```




```
Plot[ Abs[ff[k, 0]], {k, -4, 4}]
```



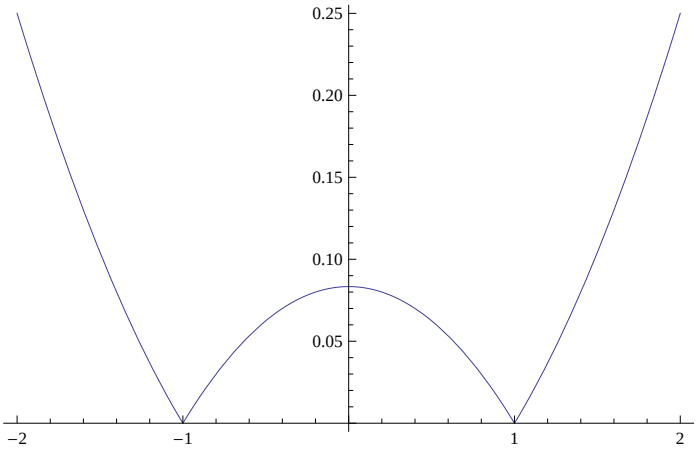
Power::infy : Infinite expression $\frac{1}{0^{3.1}}$ encountered. ≫

```
Abs[ff[3.12, 0]]
```

Power::infy : Infinite expression $\frac{1}{0^{2.12}}$ encountered. ≫

∞

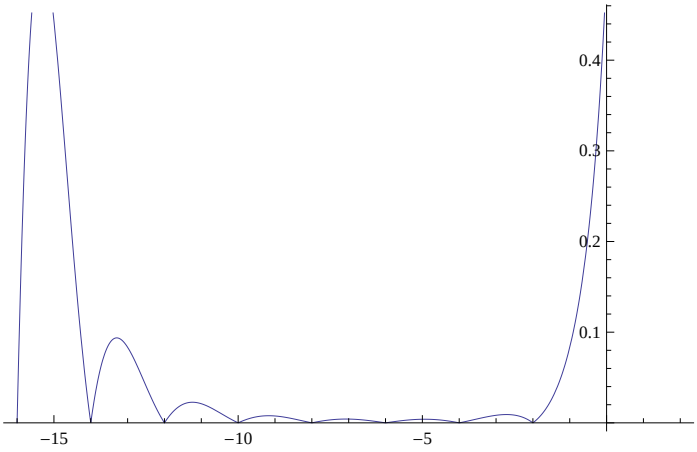
```
Plot[ Abs[ff[-1, k]], {k, -2, 2}]
```



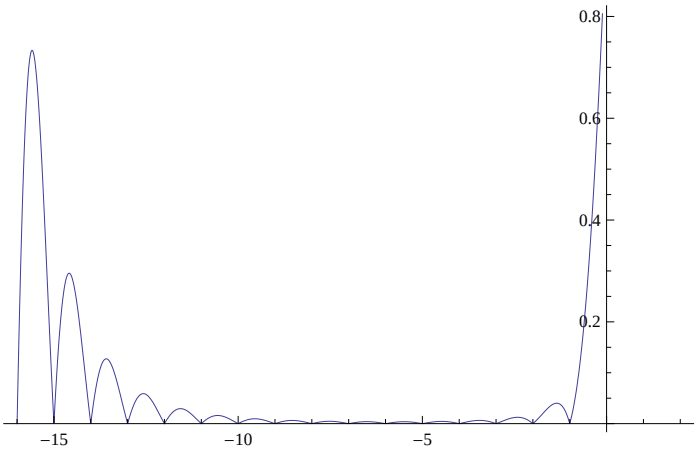

```
ff[-1 / 2, 0]
```

$\text{Zeta}\left[-\frac{1}{2}\right]$

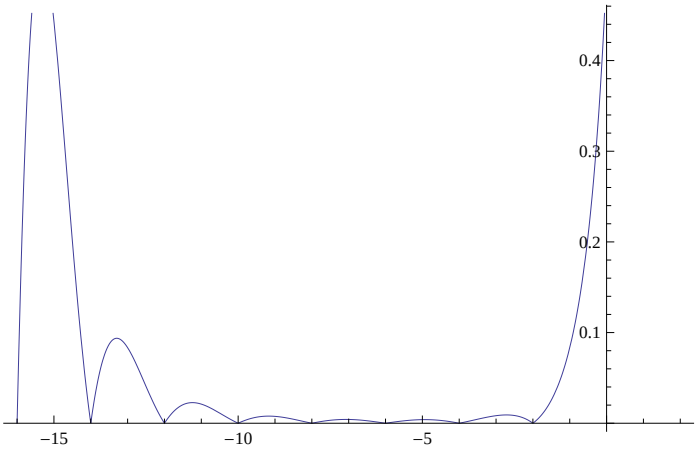
```
Plot[ Abs[ff[k, 0]], {k, -16, 2}]
```



```
Plot[ Abs[ff[k, -1]], {k, -16, 2}]
```




```
Plot[ Abs[ff[k, 0]], {k, -16, 2}]
```




```
ff[1, 2]
```

Infinity::indet : Indeterminate expression 0 ComplexInfinity encountered. ≫

```
Indeterminate
```

```
Limit[ HarmonicNumber[(-1) x] - HarmonicNumber[x], {x → Infinity}]
```

```
{Interval[{-∞, ∞}]}
```

```
Sum[ 1 / (2 n + 1), {n, 0, Infinity}]
```

Sum::div : Sum does not converge. ≫

$$\sum_{n=0}^{\infty} \frac{1}{1+2n}$$

```
Zeta[3.17]
```

```
1.17156
```

```
2^(3.17) Pi^(3.17 - 1) Sin[Pi 3.17 / 2] Gamma[1 - 3.17] Zeta[1 - 3.17]
```

```
1.17156
```

```
Zeta[1 - 3.17]
```

```
0.00429085
```

```
st[s_] := 2^(s) Pi^(s - 1) Sin[Pi s / 2] Gamma[1 - s] Zeta[1 - s]
```

```
st[2.3]
```

```
1.43242
```

```
Zeta[1 - 2.3]
```

```
-0.0434641
```

```
Zeta[2.3]
```

```
1.43242
```

```
2^(s) Pi^(s - 1) Sin[Pi s / 2] Gamma[1 - s] Zeta[1 - s] /. s → 3.3
```

```
1.15194
```

```
Zeta[3.3]
```

```
1.15194
```

```
ff[3.3]
```

```
0.918027
```

```
zt[s_] := ff[s] / (1 - 2^(1 - s))
```

```
zt[3.3]
```

```
1.15194
```

```
ff[s_] := (1 - t^(1 - s)) Zeta[s] /. t → 2
(2^(s) Pi^(s - 1) Sin[Pi s / 2] Gamma[1 - s] ff[1 - s] / (1 - t^s)) /. {s → 3.3, t → 2}
ff[s] / (1 - t^(1 - s)) /. {s → 3.3, t → 2}
```

```
1.15194
```

```
1.15194
```

```
ff[s_] := (1 - t^(1 - s)) Zeta[s] /. t → 2
(1 - t^(1 - s)) (2^(s) Pi^(s - 1) Sin[Pi s / 2] Gamma[1 - s] ff[1 - s] / (1 - t^s)) /.
 {s → 3.3, t → 2}
ff[s] /. {s → 3.3}
```

```
0.918027
```

```
0.918027
```

```
ff[s_] := (1 - t^(1 - s)) Zeta[s] /. t → 3
(1 - t^(1 - s)) (2^(s) Pi^(s - 1) Sin[Pi s / 2] Gamma[1 - s] ff[1 - s] / (1 - t^s)) /.
 {s → 4.3, t → 3}
ff[s] /. {s → 4.3}
```

```
1.03593
```

```
1.03593
```

```
gg[s_] := (1 - t^(1 - s)) Zeta[s]
```

```
FullSimplify[(1 - t^(1 - s)) (2^(s) Pi^(s - 1) Sin[Pi s / 2] Gamma[1 - s] hh[1 - s] / (1 - t^s))]
```

$$\frac{2^s \pi^{-1+s} \left(1 - t^{1-s}\right) \text{Gamma}[1 - s] \, \text{hh}[1 - s] \, \text{Sin}\left[\frac{\pi s}{2}\right]}{1 - t^s}$$

```
2^s π^(-1+s) (1 - t^(1-s)) / (1 - t^s) Gamma[1 - s] hh[1 - s] Sin[π s / 2]
```

$$\frac{2^s \pi^{-1+s} \left(1 - t^{1-s}\right) \text{Gamma}[1 - s] \, \text{hh}[1 - s] \, \text{Sin}\left[\frac{\pi s}{2}\right]}{1 - t^s}$$

```
ff[s_] := (1 - t^(1 - s)) Zeta[s] /. t → 3
```

```
2^s π^(-1+s) (1 - t^(1-s)) / (1 - t^s) Gamma[1 - s] ff[1 - s] Sin[π s / 2] /. {s → 3.1, t → 3}
```

```
ff[s] /. {s → 3.1}
```

```
1.06558
```

```
1.06558
```

```
ff[s_, t_] := (1 - t^(1 - s)) Zeta[s]
```

```
f1[s_, t_] := 2^s π^(-1+s) (1 - t^(1-s)) / (1 - t^s) Gamma[1 - s] ff[1 - s, t] Sin[π s / 2]
```

```
N[ff[.5, -2]]
```

```
-1.46035 + 2.06525 i
```

```
N[f1[.5, -2]]
```

```
-1.46035 + 2.06525 i
```

```
N[f1[.5, -1]]
```

```
-1.46035 + 1.46035 i
```

```
N[f1[.5, -.5]]
```

```
-1.46035 + 1.03263 i
```

```
N[f1[.7, -.5]]
```

```
-1.4519 + 1.82575 i
```

```
N[f1[.7, -1]]
```

```
-1.14529 + 2.24776 i
```

```
Table[{k, N[ff[.5, k]]}, {k, -2, 2, .1}] // TableForm
```

```
-2.     -1.46035 + 2.06525 i
-1.9    -1.46035 + 2.01296 i
-1.8    -1.46035 + 1.95927 i
-1.7    -1.46035 + 1.90407 i
-1.6    -1.46035 + 1.84722 i
-1.5    -1.46035 + 1.78856 i
-1.4    -1.46035 + 1.72791 i
-1.3    -1.46035 + 1.66506 i
-1.2    -1.46035 + 1.59974 i
-1.1    -1.46035 + 1.53163 i
-1.     -1.46035 + 1.46035 i
-0.9    -1.46035 + 1.38541 i
-0.8    -1.46035 + 1.30618 i
-0.7    -1.46035 + 1.22182 i
-0.6    -1.46035 + 1.13119 i
-0.5    -1.46035 + 1.03263 i
-0.4    -1.46035 + 0.923609 i
-0.3    -1.46035 + 0.799869 i
-0.2    -1.46035 + 0.65309 i
-0.1    -1.46035 + 0.461805 i
0.      -1.46035
0.1     -0.99855
0.2     -0.807264
0.3     -0.660485
0.4     -0.536745
0.5     -0.427728
0.6     -0.329169
0.7     -0.238534
0.8     -0.154174
0.9     -0.0749406
1.      0.
1.1     0.0712782
1.2     0.139384
1.3     0.204706
1.4     0.26756
1.5     0.328207
1.6     0.386864
1.7     0.443715
1.8     0.498917
1.9     0.552605
2.      0.604899
```

```
ff[.5, -1]
```

```
-1.46035 + 1.46035 i
```

```
ff[x, -1]
```

```
(1 - (-1)^(1-x)) Zeta[x]
```

```
N[Zeta[1 / 2]]
```

```
-1.46035
```

```
zt2[s_, l_] := Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
```

```
N[zt2[-.5, 300]]
```

$$-0.207637 + 0.\,i$$

```
N[Zeta[-.5]]
```

$$-0.207886$$

```
zt3[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
```

```
zt3[.5, 300]
```

$$0.605141 + 0.\,i$$

```
et[s_] := (1 - t^(1 - s)) Zeta[s] /. t → 2
```

```
et[.5]
```

$$0.604899$$

```
zt3a[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
```

```
FullSimplify[(1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])]
```

$$\frac{2^{-s}\,(-2+2^{s})\,\pi^{s/2}\prod_{r=1}^{l}\left(1-\frac{s}{\text{ZetaZero}[-r]}\right)\left(1-\frac{s}{\text{ZetaZero}[r]}\right)}{(-1+s)\,s\,\text{Gamma}\left[\frac{s}{2}\right]}$$

```
Gamma[1 + 1 / 2]
```

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

```
Limit[2^-s (-2 + 2^s) π^(s/2) / ((-1 + s) s Gamma[s/2]), {s → 1}]
```

$$\{\text{Log}[2]\}$$

```
Limit[2^-s (-2 + 2^s) π^(s/2) / ((-1 + s) s Gamma[s/2]), {s → 1}]
```

```
Limit[(1 - 3^(1 - s)) Pi^(s / 2) / (2 (s - 1) Gamma[1 + s / 2]), s → 1]
```

$$\text{Log}[3]$$

```
Limit[(1 - 2^(1 - s)) Pi^(s / 2) / (2 (s - 1) Gamma[1 + s / 2]), s → 2]
```

$$\frac{\pi}{4}$$

```
zt4[s_, l_] := Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt4[1, 300]]
```

$$1. - 2.28116 \times 10^{-16}\, i$$

```
N[1 - 1 / ZetaZero[1]]
```

$$0.997501 + 0.0706593\, i$$

```
N[1 + 1 / ZetaZero[1]]
```

$$1.0025 - 0.0706593\, i$$

```
N[(1 - 1 / .5) (1 - 1 / .5)]
```

$$1.$$

```
FullSimplify[(1 - 1 / (a + b I)) (1 - 1 / (a - b I))]
```

```
fe[a_, b_] := 1 + (1 - 2 a) / (a^2 + b^2)
```

```
fe[.4, s]
```

$$1 + \frac{0.2}{0.16 + s^2}$$

```
FullSimplify[(1 - s / (a + b I)) (1 - s / (a - b I))]
```

$$\frac{b^2 + (a - s)^2}{a^2 + b^2}$$

```
fe2[s_, a_, b_] := (b^2 + (a - s)^2) / (a^2 + b^2)
```

```
FullSimplify[fe2[1, a, b]]
```

$$1 + \frac{1 - 2\,a}{a^2 + b^2}$$

$$\left(1 + \frac{1 - 2\,(1/2 - c)}{(1/2 - c)^2 + b^2}\right)\left(1 + \frac{1 - 2\,(1/2 + c)}{(1/2 + c)^2 + b^2}\right)$$

```
Expand[(1 + (1 - 2 (1/2 - c)) / (b^2 + (1/2 - c)^2)) (1 + (1 - 2 (1/2 + c)) / (b^2 + (1/2 + c)^2))]
```

```
FullSimplify[1 + 2 c / (b^2 + (1/2 - c)^2) - 2 c / (b^2 + (1/2 + c)^2) - 4 c^2 / ((b^2 + (1/2 - c)^2) (b^2 + (1/2 + c)^2))]
```

```
1
```

```
FullSimplify[Expand[(1 + (1 - 2 (-c)) / (b^2 + (a - c)^2)) (1 + (1 - 2 (a + c)) / (b^2 + (a + c)^2))]]
```

$$\frac{\left((-1+a)^2+b^2\right)^2+2\left(-(-1+a)^2+b^2\right)c^2+c^4}{a^4+2a^2(b-c)(b+c)+\left(b^2+c^2\right)^2}$$

```
zt5[s_, l_] := Sum[Log[1 - s / ZetaZero[r]] + Log[1 - s / ZetaZero[-r]], {r, 1, l}]
```

```
N[zt5[-1, 40]]
```

```
0.0358945 + 0. i
```

```
Log[1 - s / ZetaZero[r]]
```

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

```
Limit[(1 - 2^(1 - s)) Pi^(s / 2) / (2 (s - 1) Gamma[1 + s / 2]), s → 2]
```

$$\frac{\pi}{4}$$

```
Limit[(1 - 2^(1 - s)) Pi^(s / 2) / (2 (s - 1) Gamma[1 + s / 2]), s → 3]
```

$$\frac{\pi}{4}$$

```
Limit[(1 - 2^(1 - s)) Pi^(s / 2) / (2 (s - 1) Gamma[1 + s / 2]), s → 4]
```

$$\frac{7\pi^2}{96}$$

```
Limit[(1 - 2^(1 - s)) Pi^(s / 2) / (2 (s - 1) Gamma[1 + s / 2]), s → 5]
```

$$\frac{\pi^2}{16}$$

```
ff[s_, a_] := (1 - a^(1 - s)) Zeta[s]
```

```
ff[3, 2]
```

```
N[3 Zeta[3] / 4]
```

0.901543

```
zt3[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
```

```
N[zt3[3, 800]]
```

$0.897019 - 4.36283 \times 10^{-16}\,i$

```
N[ff[3, 2]]
```

0.901543

```
zt33[l_] := Product[(1 - 3 / ZetaZero[r]) (1 - 3 / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt33[700]]
```

$1.14158 - 6.93889 \times 10^{-17}\,i$

```
N[3 Zeta[3] / Pi]
```

1.14788

```
ff[2, 2]
```

```
zt22[l_] := (1 - 2^(1 - 2)) Pi^(2 / 2)
  Product[(1 - 2 / ZetaZero[r]) (1 - 2 / ZetaZero[-r]), {r, 1, l}] / (2 (2 - 1) Gamma[1 + 2 / 2])
```

```
N[zt22[500]]
```

$0.82058 + 1.11022 \times 10^{-16}\,i$

```
(1 - 2^(1 - 2)) Pi^(2 / 2) / (2 (2 - 1) Gamma[1 + 2 / 2])
```

```
ff[2, 2] / (π / 4)
```

```
N[π / 3]
```

1.0472

```
zt222[l_] := Product[(1 - 2 / ZetaZero[r]) (1 - 2 / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt222[400]]
```

$1.04442 + 5.55112 \times 10^{-16}\,i$

```
ff[-1, 2]
```

$\frac{1}{4}$

```
ztm[l_] := (1 - 2^(1 - (-1))) Pi^((-1) / 2)
  Product[(1 - (-1) / ZetaZero[r]) (1 - (-1) / ZetaZero[-r]), {r, 1, l}] /
   (2 ((-1) - 1) Gamma[1 + (-1) / 2])
```

```
N[ztm[700]]
```

$0.249542 + 4.16334 \times 10^{-17}\,i$

```
(1 - 2^(1 - (-1))) Pi^((-1) / 2) / (2 ((-1) - 1) Gamma[1 + (-1) / 2])
```

$\frac{3}{4\pi}$

```
ztmm[l_] := Product[(1 + 1 / ZetaZero[r]) (1 + 1 / ZetaZero[-r]), {r, 1, l}]
```

```
N[Pi / 3]
```

1.0472

```
N[ztmm[500]]
```

$1.04479 + 3.88578 \times 10^{-16}\,i$

```
zt3[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
```

```
ff[-2, 2]
```

0

```
zt3m2[l_] := (1 - 2^(1 - (-2))) Pi^((-2) / 2)
  Product[(1 - (-2) / ZetaZero[r]) (1 - (-2) / ZetaZero[-r]), {r, 1, l}] /
   (2 ((-2) - 1) Gamma[1 + (-2) / 2])
```

```
zt3m2[400]
```

0

```
(1 - 2^(1 - (-2))) Pi^((-2) / 2) / (2 ((-2) - 1) Gamma[1 + (-2) / 2])
```

0

```
zt3m22[l_] := Product[(1 + 2 / ZetaZero[r]) (1 + 2 / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt3m22[1600]]
```

$1.14432 + 5.55112 \times 10^{-16}\,i$

```
zt3hlf[l_] := (1 - 2^(1 - (1 / 2))) Pi^((1 / 2) / 2)
  Product[(1 - (1 / 2) / ZetaZero[r]) (1 - (1 / 2) / ZetaZero[-r]), {r, 1, l}] /
   (2 ((1 / 2) - 1) Gamma[1 + (1 / 2) / 2])
```

```
N[zt3hlf[300]]
```

$0.605141 - 1.11022 \times 10^{-16}\,i$

```
(1 - 2^(1 - (1 / 2))) Pi^((1 / 2) / 2) / (2 ((1 / 2) - 1) Gamma[1 + (1 / 2) / 2])
```

$$-\frac{\left(1-\sqrt{2}\right)\pi^{1/4}}{\text{Gamma}\left[\frac{5}{4}\right]}$$

$$-\frac{\left(1-\sqrt{2}\right)\pi^{1/4}}{\text{Gamma}\left[\frac{5}{4}\right]}$$

```
ff[1 / 2, 2]
```

```
N[(1 - Sqrt[2]) Zeta[1/2]]
```

0.604899

```
ff[1 / 2, 2] / (-(1 - Sqrt[2]) Pi^(1/4) / Gamma[5/4])
```

```
N[-Gamma[5/4] Zeta[1/2] / Pi^(1/4)]
```

0.994242

```
zt3hlf2[l_] := Product[(1 - (1 / 2) / ZetaZero[r]) (1 - (1 / 2) / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt3hlf2[400]]
```

$0.994572 - 5.55112 \times 10^{-17}\,i$

```
zt3[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
zt4[l_] := (1 - 2^(1 - 4)) Pi^(4 / 2)
  Product[(1 - 4 / ZetaZero[r]) (1 - 4 / ZetaZero[-r]), {r, 1, l}] / (2 (4 - 1) Gamma[1 + 4 / 2])
```

```
N[zt4[700]]
```

$0.936661 - 1.11022 \times 10^{-16}\,i$

```
N[ff[4, 2]]
```

0.947033

```
ff[4, 2]
```

$$\frac{7\pi^4}{720}$$

```
(1 - 2^(1 - 4)) Pi^(4 / 2) / (2 (4 - 1) Gamma[1 + 4 / 2])
```

$$\frac{7\pi^2}{96}$$

$$\frac{7\,\pi^4}{720} \Big/ \frac{7\,\pi^2}{96}$$

```
N[2 π^2 / 15]
```

1.31595

```
zt42[l_] := Product[(1 - 4 / ZetaZero[r]) (1 - 4 / ZetaZero[-r]), {r, 1, l}]
N[zt42[1200]]
```

$1.30597 - 7.77156 \times 10^{-16}\,i$

```
zt322[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
ff[2, 2]
```

$$\frac{\pi^2}{12} \Big/ \frac{\pi}{4}$$

```
N[π / 3]
```

1.0472

```
zt322a[l_] := (1 - 2^(1 - 2)) Pi^(2 / 2)
  Product[(1 - 2 / ZetaZero[r]) (1 - 2 / ZetaZero[-r]), {r, 1, l}] / (2 (2 - 1) Gamma[1 + 2 / 2])
(1 - 2^(1 - 2)) Pi^(2 / 2) / (2 (2 - 1) Gamma[1 + 2 / 2])
```

$$\frac{\pi}{4}$$

```
zt322b[l_] := Product[(1 - 2 / ZetaZero[r]) (1 - 2 / ZetaZero[-r]), {r, 1, l}]
N[zt322b[700]]
```

$1.04528 + 2.22045 \times 10^{-16}\,i$

```
zt35[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
zt35a[l_] := (1 - 2^(1 - 5)) Pi^(5 / 2)
  Product[(1 - 5 / ZetaZero[r]) (1 - 5 / ZetaZero[-r]), {r, 1, l}] / (2 (5 - 1) Gamma[1 + 5 / 2])
(1 - 2^(1 - 5)) Pi^(5 / 2) / (2 (5 - 1) Gamma[1 + 5 / 2])
```

$$\frac{\pi^2}{16}$$

```
ff[5, 2]
```

$$\frac{15\,\text{Zeta}[5]}{16} \Big/ \frac{\pi^2}{16}$$

```
N[15 Zeta[5] / π^2]
```

1.57594

```
zt35a[l_] := Product[(1 - 5 / ZetaZero[r]) (1 - 5 / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt35a[700]]
```

$1.54728 - 5.55112 \times 10^{-16}\, i$

```
zt36[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
zt36a[l_] := (1 - 2^(1 - 6)) Pi^(6 / 2)
  Product[(1 - 6 / ZetaZero[r]) (1 - 6 / ZetaZero[-r]), {r, 1, l}] / (2 (6 - 1) Gamma[1 + 6 / 2])
(1 - 2^(1 - 6)) Pi^(6 / 2) / (2 (6 - 1) Gamma[1 + 6 / 2])
```

$\frac{31\,\pi^3}{1920}$

```
ff[6, 2]
```

$\frac{31\,\pi^6}{30\,240} \Big/ \frac{31\,\pi^3}{1920}$

```
N[4 π^3 / 63]
```

1.96865

```
zt36b[l_] := Product[(1 - 6 / ZetaZero[r]) (1 - 6 / ZetaZero[-r]), {r, 1, l}]
N[zt36b[1100]]
```

$1.92926 + 4.44089 \times 10^{-16}\, i$

```
N[2^(3 / 2) Pi^(5 / 2) / 31]
```

1.59609

```
2^(5 / 2)
```

$4\sqrt{2}$

```
N[3 Zeta[3] / Pi] - N[2^(1 / 2) Pi^(3 / 2) / 7]
```

0.0229076

```
N[3 Zeta[3] / Pi]
```

1.14788

```
N[15 Zeta[5] / π^2 - (2^(3 / 2) Pi^(5 / 2)) / 31]
```

-0.020151

```
zt37[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
zt37a[l_] := (1 - 2^(1 - 7)) Pi^(7 / 2)
  Product[(1 - 7 / ZetaZero[r]) (1 - 7 / ZetaZero[-r]), {r, 1, l}] / (2 (7 - 1) Gamma[1 + 7 / 2])
```

```
(1 - 2^(1 - 7)) Pi^(7 / 2) / (2 (7 - 1) Gamma[1 + 7 / 2])
```

$$\frac{\pi^3}{80}$$

```
ff[7, 2]
```

$$\frac{63\,\text{Zeta}[7]}{64} \Big/ \frac{\pi^3}{80}$$

```
N[315 Zeta[7] / (4 π^3)]
```

2.56101

```
N[2^(5 / 2) Pi^(7 / 2) / 127]
```

2.44791

```
zt37b[l_] := Product[(1 - 7 / ZetaZero[r]) (1 - 7 / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt37b[1200]]
```

$2.4937 + 6.10623 \times 10^{-16}\,i$

```
zt38[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
zt38a[l_] := (1 - 2^(1 - 8)) Pi^(8 / 2)
  Product[(1 - 8 / ZetaZero[r]) (1 - 8 / ZetaZero[-r]), {r, 1, l}] / (2 (8 - 1) Gamma[1 + 8 / 2])
```

```
N[zt38a[700]]
```

$0.946327 - 3.33067 \times 10^{-16}\,i$

```
ff[8, 2]
```

$$\frac{127\,\pi^8}{1\,209\,600}$$

```
N[127 π^8 / 1209600]
```

0.996233

```
(1 - 2^(1 - 8)) Pi^(8 / 2) / (2 (8 - 1) Gamma[1 + 8 / 2])
```

$$\frac{127\,\pi^8}{1\,209\,600} \Big/ \frac{127\,\pi^4}{43\,008}$$

```
N[8 π^4 / 225]
```

3.46343

```
zt38b[l_] := Product[(1 - 8 / ZetaZero[r]) (1 - 8 / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt38b[1200]]
```

$3.34259 - 3.33067 \times 10^{-15}\, i$

```
zt39[s_, l_] := Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
zt39a[l_] := Pi^(9 / 2) Product[(1 - 9 / ZetaZero[r]) (1 - 9 / ZetaZero[-r]), {r, 1, l}] /
   (2 (9 - 1) Gamma[1 + 9 / 2])
```

```
N[zt39a[1200]]
```

$0.957282 - 2.77556 \times 10^{-16}\, i$

```
N[Zeta[9]]
```

1.00201

```
N[255 Zeta[9] / 256]
```

0.998094

```
Pi^(9 / 2) / (2 (9 - 1) Gamma[1 + 9 / 2])
```

$$\frac{2\,\pi^4}{945}$$

```
N[945 π^5 / 2]
```

144 594.

```
Zeta[9] / (2 π^4 / 945)
```

```
N[945 Zeta[9] / (2 π^4)]
```

4.86042

```
zt39b[l_] := Product[(1 - 9 / ZetaZero[r]) (1 - 9 / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt39b[1200]]
```

$4.64347 + 2.27596 \times 10^{-15}\, i$

```
zt399[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
```

```
zt399a[l_] := (1 - 2^(1 - 9)) Pi^(9 / 2)
  Product[(1 - 9 / ZetaZero[r]) (1 - 9 / ZetaZero[-r]), {r, 1, l}] / (2 (9 - 1) Gamma[1 + 9 / 2])
```

```
N[zt399a[900]]
```

$$0.944022 + 1.11022 \times 10^{-16}\, i$$

```
ff[9, 2]
```

```
N[255 Zeta[9] / 256]
```

$$0.998094$$

```
(1 - 2^(1 - 9)) Pi^(9 / 2) / (2 (9 - 1) Gamma[1 + 9 / 2])
```

$$\frac{17\,\pi^4}{8064}$$

```
255 Zeta[9] / 256 / (17 π^4 / 8064)
```

```
N[945 Zeta[9] / (2 π^4)]
```

$$4.86042$$

```
zt399b[l_] := Product[(1 - 9 / ZetaZero[r]) (1 - 9 / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt399b[900]]
```

$$4.5971 - 3.55271 \times 10^{-15}\, i$$

```
N[8 Pi^4 / 255]
```

$$3.05597$$

```
zt310[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
zt310a[l_] := (1 - 2^(1 - 10)) Pi^(10 / 2)
  Product[(1 - 10 / ZetaZero[r]) (1 - 10 / ZetaZero[-r]), {r, 1, l}] / (2 (10 - 1) Gamma[1 + 10 / 2])
```

```
N[zt310a[900]]
```

$$0.931849 - 2.77556 \times 10^{-16}\, i$$

```
ff[10, 2]
```

```
N[73 π^10 / 6 842 880]
```

$$0.99904$$

```
(1 - 2^(1 - 10)) Pi^(10 / 2) / (2 (10 - 1) Gamma[1 + 10 / 2])
```

$$\frac{73\,\pi^{10}}{6\,842\,880} \Big/ \frac{511\,\pi^5}{1\,105\,920}$$

```
N[16 π^5 / 693]
```

```
7.06539
```

```
zt310b[l_] := Product[(1 - 10 / ZetaZero[r]) (1 - 10 / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt310b[2200]]
```

```
6.80749 + 8.88178 × 10^-16 i
```

```
N[Product[(1 + 9 / ZetaZero[r]) (1 + 9 / ZetaZero[-r]), {r, 1, 2200}]]
```

```
6.80749 + 2.22045 × 10^-15 i
```

```
N[Product[(1 - .5 / ZetaZero[r]) (1 - .5 / ZetaZero[-r]), {r, 1, 2200}]]
```

```
0.994344 + 0. i
```

```
N[Product[(1 - (ZetaZero[1]) / ZetaZero[r]) (1 - (ZetaZero[1]) / ZetaZero[-r]), {r, 1, 2200}]]
```

```
0.
```

```
1 - N[ZetaZero[1] / ZetaZero[2]]
```

```
0.327438 + 0.00778798 i
```

```
(1 - N[ZetaZero[1] / ZetaZero[2]]) (1 - N[ZetaZero[1] / ZetaZero[-2]])
```

```
0.5476 - 1.73472 × 10^-18 i
```

```
N[Product[(1 - (ZetaZero[1]) / ZetaZero[r]) (1 - (ZetaZero[1]) / ZetaZero[-r]), {r, 2, 2200}]]
```

```
0.0212549 + 3.03577 × 10^-18 i
```

```
N[Product[(1 - .75 / ZetaZero[r]) (1 - .75 / ZetaZero[-r]), {r, 1, 2200}]]
```

```
0.995755 + 0. i
```

```
N[Product[(1 - .25 / ZetaZero[r]) (1 - .25 / ZetaZero[-r]), {r, 1, 2200}]]
```

```
0.995755 + 0. i
```

```
N[Product[(1 - .5 / ZetaZero[r]) (1 - .5 / ZetaZero[-r]), {r, 1, 2200}]]
```

```
0.994344 + 0. i
```

```
N[Pi^(-1 / 2)]
```

```
0.56419
```

```
zt320[s_, l_] := (1 - 2^(1 - s)) Pi^(s / 2)
  Product[(1 - s / ZetaZero[r]) (1 - s / ZetaZero[-r]), {r, 1, l}] / (2 (s - 1) Gamma[1 + s / 2])
zt320a[l_] := (1 - 2^(1 - 20)) Pi^(20 / 2)
  Product[(1 - 20 / ZetaZero[r]) (1 - 20 / ZetaZero[-r]), {r, 1, l}] / (2 (20 - 1) Gamma[1 + 20 / 2])
```

```
ff[s_, a_] := (1 - a^(1 - s)) Zeta[s]
```

```
ff[20, 2]
```

$$\frac{91\,546\,277\,357\,\pi^{20}}{802\,857\,662\,698\,291\,200\,000}$$

```
(1 - 2^(1 - 20)) Pi^(20 / 2) / (2 (20 - 1) Gamma[1 + 20 / 2])
```

$$\frac{\mathbf{91\,546\,277\,357\,\pi^{20}}}{\mathbf{802\,857\,662\,698\,291\,200\,000}} \Big/ \frac{\mathbf{524\,287\,\pi^{10}}}{\mathbf{72\,296\,379\,187\,200}}$$

```
N[(89 400 832 π^10) / 5 685 805 125]
```

1472.48

```
zt320a[l_] := Product[(1 - 20 / ZetaZero[r]) (1 - 20 / ZetaZero[-r]), {r, 1, l}]
```

```
N[zt320a[1700]]
```

$1219.27 + 6.25278 \times 10^{-13}\,i$

```
2^26
```

67 108 864

```
ex[s_] := ff[s, 2] / ((1 - 2^(1 - s)) Pi^(s / 2) / (2 (s - 1) Gamma[1 + s / 2]))
Table[ex[s], {s, 2, 20, 1 / 2}]
```

$$\left\{\frac{\pi}{3}, \frac{3\,\text{Gamma}\left[\frac{9}{4}\right]\text{Zeta}\left[\frac{5}{2}\right]}{\pi^{5/4}}, \frac{3\,\text{Zeta}[3]}{\pi}, \frac{5\,\text{Gamma}\left[\frac{11}{4}\right]\text{Zeta}\left[\frac{7}{2}\right]}{\pi^{7/4}}, \frac{2\,\pi^2}{15}, \frac{7\,\text{Gamma}\left[\frac{13}{4}\right]\text{Zeta}\left[\frac{9}{2}\right]}{\pi^{9/4}},\right.$$
$$\frac{15\,\text{Zeta}[5]}{\pi^2}, \frac{9\,\text{Gamma}\left[\frac{15}{4}\right]\text{Zeta}\left[\frac{11}{2}\right]}{\pi^{11/4}}, \frac{4\,\pi^3}{63}, \frac{11\,\text{Gamma}\left[\frac{17}{4}\right]\text{Zeta}\left[\frac{13}{2}\right]}{\pi^{13/4}}, \frac{315\,\text{Zeta}[7]}{4\,\pi^3},$$
$$\frac{13\,\text{Gamma}\left[\frac{19}{4}\right]\text{Zeta}\left[\frac{15}{2}\right]}{\pi^{15/4}}, \frac{8\,\pi^4}{225}, \frac{15\,\text{Gamma}\left[\frac{21}{4}\right]\text{Zeta}\left[\frac{17}{2}\right]}{\pi^{17/4}}, \frac{945\,\text{Zeta}[9]}{2\,\pi^4}, \frac{17\,\text{Gamma}\left[\frac{23}{4}\right]\text{Zeta}\left[\frac{19}{2}\right]}{\pi^{19/4}},$$
$$\frac{16\,\pi^5}{693}, \frac{19\,\text{Gamma}\left[\frac{25}{4}\right]\text{Zeta}\left[\frac{21}{2}\right]}{\pi^{21/4}}, \frac{51\,975\,\text{Zeta}[11]}{16\,\pi^5}, \frac{21\,\text{Gamma}\left[\frac{27}{4}\right]\text{Zeta}\left[\frac{23}{2}\right]}{\pi^{23/4}}, \frac{22\,112\,\pi^6}{1\,289\,925},$$
$$\frac{23\,\text{Gamma}\left[\frac{29}{4}\right]\text{Zeta}\left[\frac{25}{2}\right]}{\pi^{25/4}}, \frac{405\,405\,\text{Zeta}[13]}{16\,\pi^6}, \frac{25\,\text{Gamma}\left[\frac{31}{4}\right]\text{Zeta}\left[\frac{27}{2}\right]}{\pi^{27/4}}, \frac{64\,\pi^7}{4455},$$
$$\frac{27\,\text{Gamma}\left[\frac{33}{4}\right]\text{Zeta}\left[\frac{29}{2}\right]}{\pi^{29/4}}, \frac{14\,189\,175\,\text{Zeta}[15]}{64\,\pi^7}, \frac{29\,\text{Gamma}\left[\frac{35}{4}\right]\text{Zeta}\left[\frac{31}{2}\right]}{\pi^{31/4}}, \frac{462\,976\,\pi^8}{34\,459\,425},$$
$$\frac{31\,\text{Gamma}\left[\frac{37}{4}\right]\text{Zeta}\left[\frac{33}{2}\right]}{\pi^{33/4}}, \frac{34\,459\,425\,\text{Zeta}[17]}{16\,\pi^8}, \frac{33\,\text{Gamma}\left[\frac{39}{4}\right]\text{Zeta}\left[\frac{35}{2}\right]}{\pi^{35/4}}, \frac{11\,229\,952\,\pi^9}{808\,782\,975},$$
$$\left.\frac{35\,\text{Gamma}\left[\frac{41}{4}\right]\text{Zeta}\left[\frac{37}{2}\right]}{\pi^{37/4}}, \frac{5\,892\,561\,675\,\text{Zeta}[19]}{256\,\pi^9}, \frac{37\,\text{Gamma}\left[\frac{43}{4}\right]\text{Zeta}\left[\frac{39}{2}\right]}{\pi^{39/4}}, \frac{89\,400\,832\,\pi^{10}}{5\,685\,805\,125}\right\}$$

```
Table[ex[s], {s, 2, 20}]
```

$$\left\{\frac{\pi}{3}, \frac{3\,\text{Zeta}[3]}{\pi}, \frac{2\,\pi^2}{15}, \frac{15\,\text{Zeta}[5]}{\pi^2}, \frac{4\,\pi^3}{63}, \frac{315\,\text{Zeta}[7]}{4\,\pi^3}, \frac{8\,\pi^4}{225}, \frac{945\,\text{Zeta}[9]}{2\,\pi^4},\right.$$
$$\frac{16\,\pi^5}{693}, \frac{51\,975\,\text{Zeta}[11]}{16\,\pi^5}, \frac{22\,112\,\pi^6}{1\,289\,925}, \frac{405\,405\,\text{Zeta}[13]}{16\,\pi^6}, \frac{64\,\pi^7}{4455}, \frac{14\,189\,175\,\text{Zeta}[15]}{64\,\pi^7},$$
$$\left.\frac{462\,976\,\pi^8}{34\,459\,425}, \frac{34\,459\,425\,\text{Zeta}[17]}{16\,\pi^8}, \frac{11\,229\,952\,\pi^9}{808\,782\,975}, \frac{5\,892\,561\,675\,\text{Zeta}[19]}{256\,\pi^9}, \frac{89\,400\,832\,\pi^{10}}{5\,685\,805\,125}\right\}$$

```
Table[ex[s], {s, -10, 20}]
```

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

Infinity::indet : Indeterminate expression 0 ComplexInfinity encountered. ≫

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

Infinity::indet : Indeterminate expression 0 ComplexInfinity encountered. ≫

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

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

Infinity::indet : Indeterminate expression 0 ComplexInfinity encountered. ≫

General::stop : Further output of Infinity::indet will be suppressed during this calculation. ≫

$$\left\{\text{Indeterminate}, \frac{16\,\pi^5}{693}, \text{Indeterminate}, \frac{8\,\pi^4}{225}, \text{Indeterminate}, \frac{4\,\pi^3}{63},\right.$$
$$\text{Indeterminate}, \frac{2\,\pi^2}{15}, \text{Indeterminate}, \frac{\pi}{3}, 1, \text{Indeterminate}, \frac{\pi}{3}, \frac{3\,\text{Zeta}[3]}{\pi}, \frac{2\,\pi^2}{15},$$
$$\frac{15\,\text{Zeta}[5]}{\pi^2}, \frac{4\,\pi^3}{63}, \frac{315\,\text{Zeta}[7]}{4\,\pi^3}, \frac{8\,\pi^4}{225}, \frac{945\,\text{Zeta}[9]}{2\,\pi^4}, \frac{16\,\pi^5}{693}, \frac{51\,975\,\text{Zeta}[11]}{16\,\pi^5},$$
$$\frac{22\,112\,\pi^6}{1\,289\,925}, \frac{405\,405\,\text{Zeta}[13]}{16\,\pi^6}, \frac{64\,\pi^7}{4455}, \frac{14\,189\,175\,\text{Zeta}[15]}{64\,\pi^7}, \frac{462\,976\,\pi^8}{34\,459\,425},$$
$$\left.\frac{34\,459\,425\,\text{Zeta}[17]}{16\,\pi^8}, \frac{11\,229\,952\,\pi^9}{808\,782\,975}, \frac{5\,892\,561\,675\,\text{Zeta}[19]}{256\,\pi^9}, \frac{89\,400\,832\,\pi^{10}}{5\,685\,805\,125}\right\}$$

```
ffa[s_, a_] := (1 - a^(1 - s)) Zet[s]
ex2[s_] := ffa[s, 2] / ((1 - 2^(1 - s)) Pi^(s / 2) / (2 (s - 1) Gamma[1 + s / 2]))
Table[ex2[s], {s, -10, 20}]
```

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

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

Infinity::indet : Indeterminate expression 0 ComplexInfinity encountered. ≫

$$\left\{\text{ComplexInfinity}, -\frac{64}{21}\pi^5\,\text{Zet}[-9], \text{ComplexInfinity}, \frac{128}{15}\pi^4\,\text{Zet}[-7], \text{ComplexInfinity}, -16\pi^3\,\text{Zet}[-5], \text{ComplexInfinity}, 16\pi^2\,\text{Zet}[-3], \text{ComplexInfinity}, -4\pi\,\text{Zet}[-1], -2\,\text{Zet}[0], \text{Indeterminate}, \frac{2\,\text{Zet}[2]}{\pi}, \frac{3\,\text{Zet}[3]}{\pi}, \frac{12\,\text{Zet}[4]}{\pi^2}, \frac{15\,\text{Zet}[5]}{\pi^2}, \frac{60\,\text{Zet}[6]}{\pi^3}, \frac{315\,\text{Zet}[7]}{4\pi^3}, \frac{336\,\text{Zet}[8]}{\pi^4}, \frac{945\,\text{Zet}[9]}{2\pi^4}, \frac{2160\,\text{Zet}[10]}{\pi^5}, \frac{51\,975\,\text{Zet}[11]}{16\pi^5}, \frac{15\,840\,\text{Zet}[12]}{\pi^6}, \frac{405\,405\,\text{Zet}[13]}{16\pi^6}, \frac{131\,040\,\text{Zet}[14]}{\pi^7}, \frac{14\,189\,175\,\text{Zet}[15]}{64\pi^7}, \frac{1\,209\,600\,\text{Zet}[16]}{\pi^8}, \frac{34\,459\,425\,\text{Zet}[17]}{16\pi^8}, \frac{12\,337\,920\,\text{Zet}[18]}{\pi^9}, \frac{5\,892\,561\,675\,\text{Zet}[19]}{256\pi^9}, \frac{137\,894\,400\,\text{Zet}[20]}{\pi^{10}}\right\}$$

```
ff[s_, a_] := (1 - a^(1 - s)) Zeta[s]
ex3[s_] := ff[s, 2] / ((1 - 2^(1 - s)) Pi^(s / 2) / (2 (s - 1) Gamma[1 + s / 2]))
Table[ex3[s] / (Pi^((s) / 2)), {s, 2, 20}]
```

$$\left\{\frac{1}{3}, \frac{3\,\text{Zeta}[3]}{\pi^{5/2}}, \frac{2}{15}, \frac{15\,\text{Zeta}[5]}{\pi^{9/2}}, \frac{4}{63}, \frac{315\,\text{Zeta}[7]}{4\pi^{13/2}}, \frac{8}{225}, \frac{945\,\text{Zeta}[9]}{2\pi^{17/2}}, \frac{16}{693}, \frac{51\,975\,\text{Zeta}[11]}{16\pi^{21/2}}, \frac{22\,112}{1\,289\,925}, \frac{405\,405\,\text{Zeta}[13]}{16\pi^{25/2}}, \frac{64}{4455}, \frac{14\,189\,175\,\text{Zeta}[15]}{64\pi^{29/2}}, \frac{462\,976}{34\,459\,425}, \frac{34\,459\,425\,\text{Zeta}[17]}{16\pi^{33/2}}, \frac{11\,229\,952}{808\,782\,975}, \frac{5\,892\,561\,675\,\text{Zeta}[19]}{256\pi^{37/2}}, \frac{89\,400\,832}{5\,685\,805\,125}\right\}$$

```
N[Zeta[3] / (Pi^(5 / 2))]
```

0.0687148

```
Grid[Table[N[(a / b) Zeta[3] / (Pi^(5 / 2)) * Log[5]], {a, 1, 100}, {b, 1, 20}]]
```

```
Grid[Table[N[(a / b) Zeta[2] / (Pi^(4 / 2))], {a, 2, 100}, {b, 2, 20}]]
```

```
ex3[s_] := π^(-s/2) (-1 + s) s Gamma[s/2] Zeta[s]
Table[ ex3[s] / (Pi^((s) / 2)), {s, 2, 20}]
```

$$\left\{\frac{1}{3}, \frac{3\,\text{Zeta}[3]}{\pi^{5/2}}, \frac{2}{15}, \frac{15\,\text{Zeta}[5]}{\pi^{9/2}}, \frac{4}{63}, \frac{315\,\text{Zeta}[7]}{4\,\pi^{13/2}}, \frac{8}{225}, \frac{945\,\text{Zeta}[9]}{2\,\pi^{17/2}},\right.$$
$$\frac{16}{693}, \frac{51\,975\,\text{Zeta}[11]}{16\,\pi^{21/2}}, \frac{22\,112}{1\,289\,925}, \frac{405\,405\,\text{Zeta}[13]}{16\,\pi^{25/2}}, \frac{64}{4455}, \frac{14\,189\,175\,\text{Zeta}[15]}{64\,\pi^{29/2}},$$
$$\left.\frac{462\,976}{34\,459\,425}, \frac{34\,459\,425\,\text{Zeta}[17]}{16\,\pi^{33/2}}, \frac{11\,229\,952}{808\,782\,975}, \frac{5\,892\,561\,675\,\text{Zeta}[19]}{256\,\pi^{37/2}}, \frac{89\,400\,832}{5\,685\,805\,125}\right\}$$

```
Expand[((1 - 2^(1 - s)) Zeta[s]) / ((1 - 2^(1 - s)) Pi^(s / 2) / ( 2 (s - 1) Gamma[1 + s / 2]))]
```

```
FullSimplify[-2 π^(-s/2) Gamma[1 + s/2] Zeta[s] + 2 π^(-s/2) s Gamma[1 + s/2] Zeta[s]]
```

$$\pi^{-s/2}\,(-1+s)\,s\,\text{Gamma}\left[\frac{s}{2}\right]\,\text{Zeta}[s]$$