$$\sum_{n=1}^{N}\left(\left((n)/(2n+1)\right)\right) \text{ // FullSimplify}$$

$$\frac{1}{4}\left(2N+\text{PolyGamma}\left[0,\frac{3}{2}\right]-\text{PolyGamma}\left[0,\frac{3}{2}+N\right]\right)$$

$$\sum_{n=1}^{N}\left(\left((n+1)/(2n+1)\right)\right)$$

$$\frac{1}{4}\left(2N-\text{PolyGamma}\left[0,\frac{3}{2}\right]+\text{PolyGamma}\left[0,\frac{3}{2}+N\right]\right) \text{ // FullSimplify}$$

$$\frac{1}{4}\left(-2+2N+\text{HarmonicNumber}\left[\frac{1}{2}+N\right]+\text{Log}[4]\right)$$

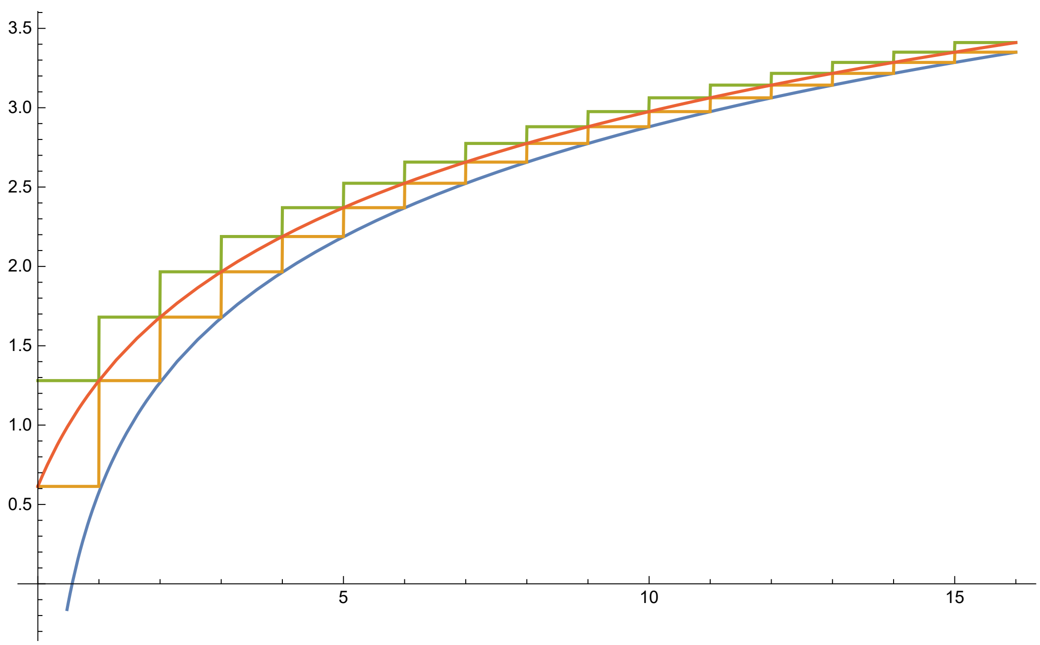
$$N\left[\text{HarmonicNumber}\left[\frac{1}{2}+N\right]\right]$$

```
HarmonicNumber[0.5 + N]
```

```
FunctionExpand[HarmonicNumber[0.5 + N]]
```

```
EulerGamma + PolyGamma[0, 1.5 + N]
```

```
Plot[{EulerGamma + Log[N], HarmonicNumber[0.5` + Floor[N]],
  HarmonicNumber[0.5` + Ceiling[N]], HarmonicNumber[0.5` + N]}, {N, 0, 16}]
```



```
Solve[HarmonicNumber[0.5` + N] == 2.5]
Solve[HarmonicNumber[0.5` + N] == 3.5]
```

Solve::ifun : Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information. >>

```
{{N → 5.8339}}
```

Solve::ifun : Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information. >>

```
{{N → 17.5907}}
```

```
HarmonicNumber[0.5` + Floor[1]]
```

```
1.28037
```

```
PolyGamma[0, 1.5` + N]
```

```
PolyGamma[0, 1.5 + N]
```

$$\sum_{n=1}^{N} (((n\text{^}(-p)) + q)\text{^}(-s))$$

$$\sum_{n=1}^{N} \left(n^{-p} + q\right)^{-s}$$

$$\sum_{n=1}^{N} \left(n^{-p} + q\right)^{-s}$$

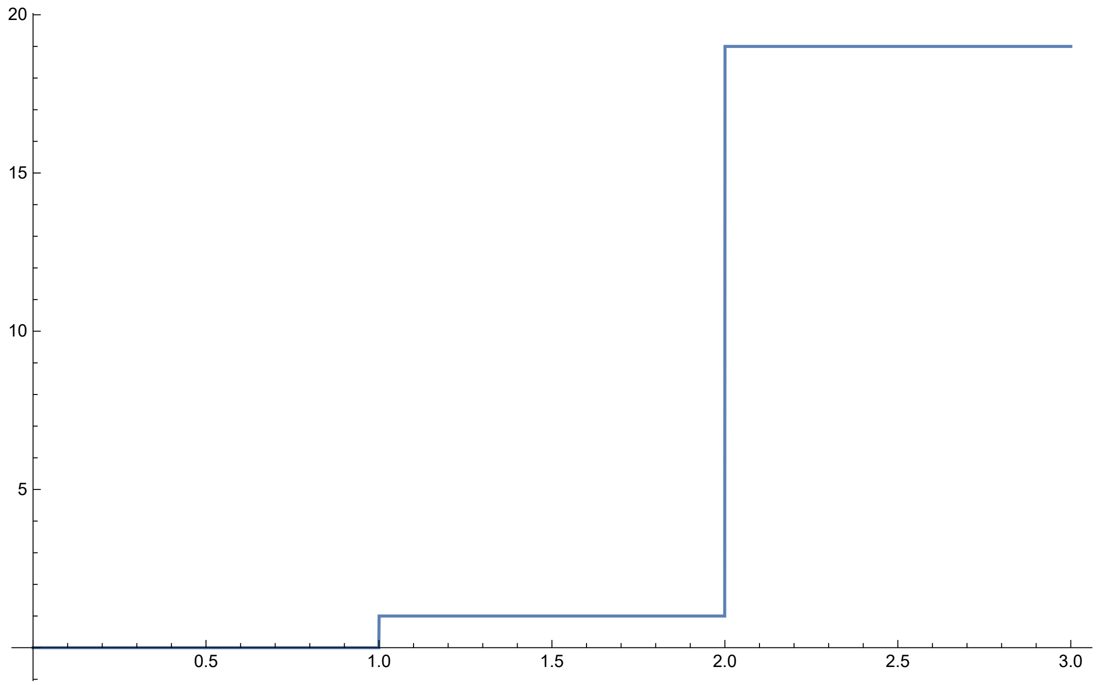
$$\prod_{n=1}^{N} \left(\left(\left(n\text{^}\left(-1\right)\right) + q\right)\text{^}(-s)\right)$$

$$\left(\frac{q^{N}\,\text{Pochhammer}\left[1 + \frac{1}{q}, N\right]}{N!}\right)^{-s}$$

$$\left(\sum_{n=1}^{N} \left(\left(\left(n\text{^}\left(-1\right)\right) + .5\right)\text{^}\left(1\right)\right)\right) \Big/ \left(\prod_{n=1}^{N} \left(\left(\left(n\text{^}\left(-1\right)\right) + .5\right)\text{^}\left(1\right)\right)\right)$$

$$\frac{1.\ e^{0.693147\,N}\ \left(N + 2.\ \text{HarmonicNumber}[N]\right)}{\left(1. + N\right)\ \left(2. + N\right)}$$

```
Plot[(Sum[(((n^(1)) + .5)^(-3)), {n, 1, N}]) / (Product[(((n^(1)) + .5)^(-3)), {n, 1, N}]), {N, 0, 3}]
```



$$\prod_{n=1}^{N} \left(\left((n) / (2n+1)\right)\right)$$

$$\prod_{n=1}^{N} \left(\left((n+1) / (2n+1)\right)\right)$$

$$\frac{2^{-1-N} \sqrt{\pi}\ \mathrm{Gamma}[1+N]}{\mathrm{Gamma}\left[\frac{3}{2}+N\right]}$$

$$\frac{2^{-1-N} \sqrt{\pi}\ \mathrm{Gamma}[2+N]}{\mathrm{Gamma}\left[\frac{3}{2}+N\right]}$$

```
Solve[Zeta[s] == 2.5, s]
Solve[Zeta[s] == 3.5, s]
```

{{s → 0.37681 − 17.8479 ⅈ}}

{{s → −1.76932 − 10.3593 ⅈ}}

$$\left(\sum_{n=1}^{N} ((n)^{(-s)})\right) \Big/ \left(\prod_{n=1}^{N} ((n^{(-s)}))\right) \ \text{// FullSimplify}$$

$(N!)^{s}$ HarmonicNumber[N, s]