```
DApprox[j_] := (-1)^j + Sum[(-1)^(j - k + 1) / (k!) n (Log[n])^k, {k, 0, j - 1}]
```

```
DApprox[j]
```

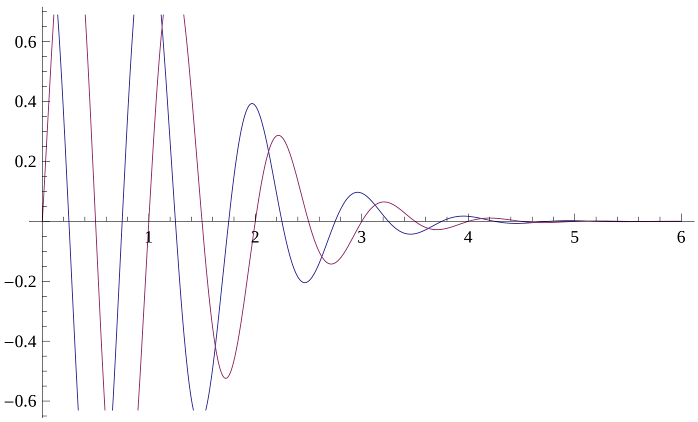
$$(-1)^j - \frac{(-1)^j \text{Gamma}[j, -\text{Log}[n]]}{\text{Gamma}[j]}$$

$$\text{FF}[n\_, j\_] := (-1)^j - \frac{(-1)^j \text{Gamma}[j, -\text{Log}[n]]}{\text{Gamma}[j]}$$

```
FF[n, -1]
```

-1

```
Plot[{Re[FF[2, j]], Im[FF[2, j]]}, {j, 0, 6}]
```



$$\text{FF2}[n\_, j\_] := \left(\left((-1)^j - \frac{(-1)^j \text{Gamma}[j, -\text{Log}[n]]}{\text{Gamma}[j]}\right) - 1\right) \Big/ j$$

```
Expand[FF2[n, 0.0000000000000001]]
```

$(0. + 3.14159\, i) - (1. + 3.14159 \times 10^{-16}\, i)\ \text{Gamma}[1. \times 10^{-16}, -\text{Log}[n]]$

```
FF3a[n_] := -Gamma[0, -Log[n]]
```

```
FF3a[n]
```

-Gamma[0, -Log[n]]

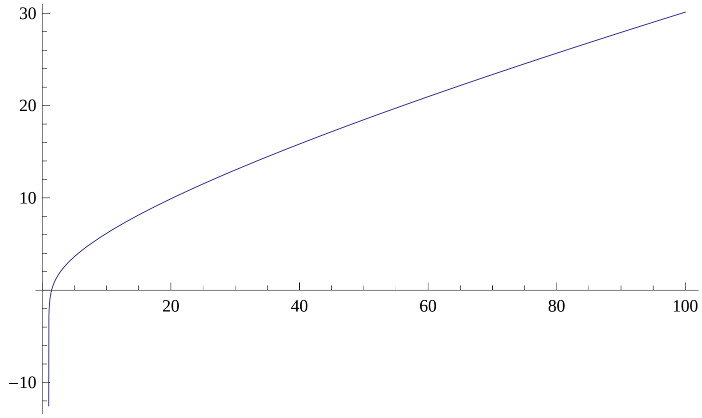
```
N[FF3a[a = 100]]
N[LogIntegral[a]]
```

30.1261 + 3.14159 i

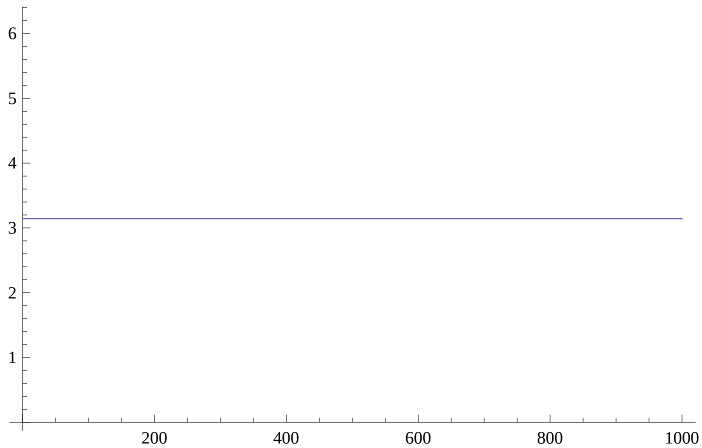
30.1261

30.1261

```
Plot[Re[-Gamma[0, -Log[n]]], {n, 1, 100}]
```




```
Plot[Im[1 - Gamma[0, -Log[n]]], {n, 1, 1000}]
```




```
-Gamma[0, -n]
```

-Gamma[0, -n]

```
Gamma[0]
```

ComplexInfinity

```
F4[n_, z_] := Sum[
```

```
FullSimplify[(1 / Gamma[z]) (1 / z)]
```

$$\frac{1}{\text{Gamma}[1+z]}$$

$$\frac{1}{\text{Gamma}[1+0]}$$

1