```
f1[y_, s_] := Log[y]^s Integrate[ y^x x^(s - 1), {x, 0, 1}]
f2[y_, s_] := Abs[ Gamma[s, 0, -Log[y]]]
```

```
N[f1[5, 3]]
```

```
4.85707
```

```
N[f2[5, 3]]
```

```
4.85707
```

```
f1a[y_, s_, n_] := Log[y]^s Integrate[ y^(n x) (n x)^(s - 1), {x, 0, 1}]
f2a[y_, s_, n_] := Abs[ Gamma[s, 0, -n Log[y]]] / n
```

```
f1b[y_, s_, n_] := (n)^(s - 1) Log[y]^s Integrate[ y^(n x) (x)^(s - 1), {x, 0, 1}]
f2b[y_, s_, n_] := Abs[ Gamma[s, 0, -n Log[y]]] / n
```

```
N[f1b[5, 4, 3]]
```

```
2735.03
```

```
N[f2b[5, 4, 3]]
```

```
2735.03
```

```
f1c[y_, s_, n_] := Log[y]^s Integrate[ y^(n x) x^(s - 1), {x, 0, 1}]
f2c[y_, s_, n_] := Abs[ Gamma[s, 0, -n Log[y]]] / n / n^(s - 1)
```

```
N[f1c[5, 4, 3]]
```

```
101.297
```

```
N[f2c[5, 4, 3]]
```

```
101.297
```

```
f1d[y_, s_, n_] := Log[y]^s Integrate[ y^(n x) x^(s - 1), {x, 0, 1}]
f2d[y_, s_, n_] := Abs[ Gamma[s, 0, -n Log[y]]] / n^s
```

```
N[f1d[3, 4, 3]]
```

```
5.73693
```

```
N[f2d[3, 4, 3]]
```

```
5.73693
```

```
f1e[y_, s_] :=  Log[y]^s Integrate[Sum[ y^(n x), {n, 1, Infinity}] x^(s - 1), {x, 0, 1}]
f2e[y_, s_] := Sum[ Abs[ Gamma[s, 0, -n Log[y]]] / n^s , {n, 1, 100 000}]
```

```
N[f1e[.5, 2]]
```

```
0.582241
```

```
N[f2e[.5, 2]]
```

```
0.582231
```

```
f1f[y_, s_] := Log[y]^s Integrate[(-y^x/(-1 + y^x)) x^(s - 1), {x, 0, 1}]
f2f[y_, s_] := Sum[ Abs[ Gamma[s, 0, -n Log[y]]] / n^s , {n, 1, 100 000}]
N[f1f[.5, 2]]
```

```
0.582241
```

```
N[f2f[.5, 2]]
```

```
0.582231
```

```
Sum[ y^(n x), {n, 1, Infinity}]
```

$$-\frac{y^x}{-1+y^x}$$

```
N[Log[100]^s Integrate[ 100^x x^(s - 1), {x, 0, 1}] /. s → 2]
```

```
361.517 - 4.41506 × 10^-14 i
```

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

```
361.517
```

```
FullSimplify[Log[100]^s Integrate[ 100^-x x^(s - 1), {x, 0, 1}] /. s → 2]
```

```
1 - Gamma[2, Log[100]]
```

```
Log[100]^s Integrate[ 100^x (-x)^(s - 1), {x, 0, 1}] /. s → 5
```

```
-24 + Gamma[5, -2 Log[10]]
```