```
pr[j_] := Product[Prime[a], {a, 1, j}]
FI[n_] := FI[n] = FactorInteger[n]; FI[1] := {}
dz[n_, z_] := Product[(-1)^p[[2]] Binomial[-z, p[[2]]], {p, FI[n]}]
d2[n_, k_] := Sum[(-1)^(k - j) Binomial[k, j] dz[n, j], {j, 0, k}]
d2z[n_, z_] := Sin[Pi z] / Pi Sum[ (-1)^k / (z - k) d2[n, k], {k, 0, Log2@n}]
d2zl[n_, z2_] := Limit[Sin[Pi z] / Pi Sum[ (-1)^k / (z - k) d2[n, k], {k, 0, Log2@n}], z → z2]
```

```
Table[D[(E^t - 1)^k, {t, j}] /. t → 0, {j, 0, 8}, {k, 1, 6}] // Grid
```

0	0	0	0	0	0
1	0	0	0	0	0
1	2	0	0	0	0
1	6	6	0	0	0
1	14	36	24	0	0
1	30	150	240	120	0
1	62	540	1560	1800	720
1	126	1806	8400	16800	15120
1	254	5796	40824	126000	191520

```
Table[k! StirlingS2[j, k], {j, 0, 8}, {k, 1, 6}] // Grid
```

0	0	0	0	0	0
1	0	0	0	0	0
1	2	0	0	0	0
1	6	6	0	0	0
1	14	36	24	0	0
1	30	150	240	120	0
1	62	540	1560	1800	720
1	126	1806	8400	16800	15120
1	254	5796	40824	126000	191520

```
Table[d2zl[pr[j], k], {j, 0, 8}, {k, 1, 6}] // Grid
```

0	0	0	0	0	0
1	0	0	0	0	0
1	2	0	0	0	0
1	6	6	0	0	0
1	14	36	24	0	0
1	30	150	240	120	0
1	62	540	1560	1800	720
1	126	1806	8400	16800	15120
1	254	5796	40824	126000	191520

```
Sum[ 6 StirlingS2[j, 3] / (j!) Log[1 + x]^j, {j, 0, Infinity}]
```

$$x^3$$

```
Sum[ d2zl[pr[j], 2.5] / (j!) Log[1 + .3]^j, {j, 0, 20}]
```

```
0.136683
```

```
.3^2.5
```

```
0.049295
```