

```
OldEa[t_, j_, k_] := TSD[⟨ |
  j → UU[a[1, j, h∞] + δaa[t, ϕ, h∞, j, k] +
    δaa[-t ϕ1[-t b_j], ϕ, k, j, h∞] + δaa[-t^2 ϕ2[-t b_j], j, k, j, h∞]],
  k → UU[a[e^{t b_j}, k, h∞] + a[-t b_k ϕ1[t b_j], j, h∞] + δhb[t^2 b_k e^{t b_j} ϕ2[-t b_j], ϕ, j, h∞] +
    δaa[-t^2 b_j e^{t b_j} ϕ2[-t b_j], ϕ, k, k, h∞] + δaa[t^2 e^{t b_j} ϕ2[-t b_j], j, k, k, h∞] +
    δaa[t ϕ1[-t b_j] + t^2 b_k e^{t b_j} ϕ2[-t b_j], ϕ, k, j, h∞] +
    δaa[-t ϕ1[t b_j] - t^2 b_k ϕ2[t b_j], ϕ, h∞, j, k] +
    δaa[ $\frac{t(\phi_1[t b_j] - \phi_1[-t b_j])}{b_j} - \frac{(2 - 2 e^{t b_j} + (1 + e^{t b_j}) t b_j) b_k}{b_j^3}, j, k, j, h\infty$ ]]
  ⟩ |];
```

```
ϕ_k[x_] := x^{-k} (e^x - Sum[x^α / α!, {α, 0, k - 1}]);
```

```
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  j → UU[a[1, j, h∞] + δaa[t, ϕ, h∞, j, k] +
    δaa[-t ϕ1[-t b_j], ϕ, k, j, h∞] + δaa[-t^2 ϕ2[-t b_j], j, k, j, h∞]],
  k → UU[a[1, k, h∞] + hb[-t ϕ1[t b_j], j, k, h∞] + δhb[t^2 b_k e^{t b_j} ϕ2[-t b_j], ϕ, j, h∞] +
    δaa[-t^2 b_j e^{t b_j} ϕ2[-t b_j], ϕ, k, k, h∞] + δaa[t^2 e^{t b_j} ϕ2[-t b_j], j, k, k, h∞] +
    δaa[-t ϕ1[t b_j] - t^2 b_k ϕ2[t b_j], ϕ, h∞, j, k] +
    δaa[t ϕ1[-t b_j] + t^2 b_k e^{t b_j} ϕ2[-t b_j], ϕ, k, j, h∞] +
    δaa[ $\frac{t(\phi_1[t b_j] - \phi_1[-t b_j])}{b_j} - \frac{(2 - 2 e^{t b_j} + (1 + e^{t b_j}) t b_j) b_k}{b_j^3}, j, k, j, h\infty$ ]] | ⟩];
```

```
Table[OldEa[t, 1, 2]_i - Ea[t, 1, 2]_i, {i, 2}]
```

```
{UU[0], UU[0]}
```

```
e^{-t b_j} (b_j + e^{2 t b_j} (b_j + (2 - t b_j) b_k) - e^{t b_j} (2 b_k + b_j (2 + t b_k))) // Expand
```

```
-2 b_j + e^{-t b_j} b_j + e^{t b_j} b_j - 2 b_k + 2 e^{t b_j} b_k - t b_j b_k - e^{t b_j} t b_j b_k
```

```
t b_j^2 (ϕ1[t b_j] - ϕ1[-t b_j]) // Expand
```

```
-2 b_j + e^{-t b_j} b_j + e^{t b_j} b_j
```

```
e^{-t b_j} (e^{2 t b_j} ((2 - t b_j) b_k) - e^{t b_j} (2 b_k + b_j (t b_k))) // Simplify
```

```
-(2 - 2 e^{t b_j} + (1 + e^{t b_j}) t b_j) b_k
```