1 Computations...

$$
\begin{aligned}
\left\langle h, V_f^* g \right\rangle &= \langle V_f h, g \rangle \\
&= \int_G \int_G h(x) \overline{f(y^{-1}x)} \, \mathrm{d}x \, \overline{g(y)} \, \mathrm{d}y \\
&= \int_G h(x) \overline{\int_G g(y) f(y^{-1}x) \, \mathrm{d}x} \, \mathrm{d}y
\end{aligned}
$$

2 Mechanics

The symmetry character of a state does not change in the course of time:

$$\psi(t) = T e^{-\frac{i}{\hbar} \int_0^t H(t') \, \mathrm{d}t'} \psi(0)$$

For arbitrary permutations P, the states introduced in the last section satisfy

$$
\begin{aligned}
&P\psi_s = \psi_s \\
&P\psi_a = (-1)^P \psi_a
\end{aligned}
$$

with

$$
(-1)^P = \begin{cases} 1 & : \text{for even permutations} \\ -1 & : \text{for odd permutations} \end{cases}
$$

Thus, the state ψ_s and ψ_a form the basis of two one-dimensional representations of the permutation group S_N. For ψ_s, every P is assigned the number 1, ...

2.1 Gauss sum

For every natural number n we have:

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

Proof:
We set $S(n) \coloneqq 1 + 2 + \ldots + n$ and show $S(n) = \frac{n(n+1)}{2}$ through complete induction.

3 More

$$
\begin{aligned}
\binom{n}{k} &\coloneqq \prod_{j=1}^{k} \frac{n - j + 1}{j} \qquad (1) \\
&= \frac{n(n-1) \cdot \ldots \cdot (n-k+1)}{1 \cdot 2 \cdot \ldots \cdot k} \qquad (2)
\end{aligned}
$$

From the definition we know the following.

$$\binom{n}{0} = 1, \qquad \binom{n}{1} = n \qquad (3)$$

Of course we know a lot from section 2.1.

3.1 Logical...

$$x < y \quad \Longleftrightarrow \quad -x > -y$$