This gives rise to a partition of $N - \frac{(k)(k+1)}{2}$. Hence

$$\text{Coeff of } z^k q^N = \text{Coeff of } z^k q^N \text{ in } \frac{z^k q^{k(k+1)/2}}{\prod_{n=1}^{\infty}(1-q^n)}$$

Similarly result also holds for $k<0$, & we obtain $(**)$. $\square$

$\boxed{\text{A Generalization of Euler's Theorem that } p(O,n) = p(D,n)}$

<u>Theorem</u> (Sylvester)

Let $k \geq 1$.

Let $A_k(n)$ = the number of partitions of n into odd parts (repitition allowed) into exactly k different parts.

Let $B_k(n)$ = the number of partitions of n into exactly k noncontiguous sequences of one or more consecutive integers.

Then $A_k(n) = B_k(n)$ for all n.

<u>Example</u> $n=14$, $k=3$.

Partitions of $n=14$ into odd parts (repitition allowed) with 3 different parts:

$9+3+1+1$ So $A_3(14) = 7$

$7+5+1+1$

$7+3+3+1$

$7+3+1+1+1+1$

$5+5+3+1$

$5+3+3+1+1+1$

$5+3+1+1+1+1+1+1$