VKSU

* n^{th} differential co-efficients of some standard functions -

1. n^{th} differential of x^m.

Let $y = x^m$

Then $y_1 = mx^{m-1}$

$y_2 = m(m-1)x^{m-2}$

$y_3 = m(m-1)(m-2)x^{m-3}$

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Let us suppose that $y_n = m(m-1)(m-2)(m-3)$ - - - - - - - $(m-n+1)x^{m-n}$ ——— (1)

Differentiating again, we get

$y_{n+1} = m(m-1)(m-2)(m-3)\ldots\ldots(m-n+1)\overset{m-n}{(m-n)}$

which is of the same form as (1) with n replaced by $(n+1)$

Since (1) is true for $n = 1, 2, 3 \ldots$

therefore by the method of induction (1) is true for all n.

That is if

$y = x^m$, then

$y_n = m(m-1)(m-2)(m-3)\ldots\ldots(m-n+1)x^{m-n}$