XPXP SHORTS USING MACLAURIN APPROXIMATIONS

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These short statements provide evidence, in simple terms, of some of the basic elements of the XPXP model. More detailed explanations may be found in the videos and papers in the web site.

<u>**HOW DO MACLAURIN APPROXIMATIONS HELP IN XPXP ?**</u>

Because all exponential expressions are instantaneous, an approximation of an XPXP value is probably the best way to get a concept of the model.

To approximate an exponential statement, a mathematical tool is a MacLaurin expansion, which has simple rules <u>when the exponent is small.</u> The exponents for typical universal values are certainly very small. Ho is on the order of 10^-18 /sec.

A MacLaurin expansion of $e^{H_0 t} \approx H_0 t + 1$, where the approximate value is simply the exponent +1. A MacLaurin expansion helps identify mathematical mistakes and to guide the progress of difficult calculations.

As an example, the result of the H/L law is:

$$R = R_0 e^{H_0 t}$$

Using a MacLaurin expansion:

$$R_0 e^{H_0 t} \approx R_0 (H_0 t + 1) \approx H_0 R_0 t + R_0$$

This result has the form of the standard distance equation for any unaccelerated motion, where **R = Ro + (velocity · time**)

Therefore, the standard math of the λCDM MODEL is an approximation of the exponential expression for universal expansion. It is notable that the distance formula is presently used on all scales to measure the universe.

Throughout the description of the XPXP model, there are occasions when MacLaurin approximations are shown as a check of the work.