1135-83-2365 **Arthur E Fischer*** (aef@ucsc.edu), Department of Mathematics, University of California, Santa Cruz, CA 95064. *A Simple All-time Model for the Birth, Big Bang, and Death of the Universe.*

We model the standard ΛCDM model of the universe by the spatially-flat Friedmann-Lemaître line element

$$ds^2_{\Lambda\text{CDM}} = -c^2dt^2 + \Big(\frac{8\pi G\rho_{m,0}}{\Lambda c^2}\Big)^{2/3}\Big(\sinh\big(\tfrac{3}{2}\sqrt{\Lambda/3}\;ct\big)\Big)^{4/3} d\sigma^2_{\text{Euclid}}$$

which we *extend* for all time $t \in (-\infty, \infty)$. This line element is C^∞ and *solves Friedmann's equation* for all $t \neq 0$ and is C^1 at $t = 0$. We use this *extended* line element to show that encoded into Friedmann's equation is (1) the prediction that the universe existed *before* the big bang; (2) that the big bang was preceded by a negative time epoch $(-\infty, 0)$; (3) that the universe was asymptotically created out of nothing at $t = -\infty$ from an *unstable* negative half de Sitter $ds^2_{dS_4^-}$ initial state; and (4) asymptotically dies at $t = \infty$ as the *stable* positive half de Sitter $ds^2_{dS_4^+}$ final state. Since these two de Sitter states are vacuum states, our model shows that the universe was created *de novo* from nothing at $t = -\infty$ and dies to nothing at $t = \infty$, and is thus a variant of the *zero energy universe*, with our extended ΛCDM model interpolating between the initial and final state. (Received September 26, 2017)