$$\Delta N-(T+\Delta T)\cdot\sin\left(\frac{\Delta\theta}{2}\right)-T\cdot\sin\left(\frac{\Delta\theta}{2}\right)=0\xrightarrow[\;]{explicit\\ solve,\Delta N\\ simplify}\sin\left(\frac{\Delta\theta}{2}\right)\cdot(2\cdot T+\Delta T)$$

$$\sum Fy=0$$

$$(T+\Delta T)\cdot\cos\left(\frac{\Delta\theta}{2}\right)-T\cdot\cos\left(\frac{\Delta\theta}{2}\right)-\mu_s\cdot\Delta N=0\xrightarrow[\;]{explicit\\ substitute,\Delta N=\sin\left(\frac{\Delta\theta}{2}\right)\cdot(2\cdot T+\Delta T)}\Delta T\cdot\cos\left(\frac{\Delta\theta}{2}\right)-2\cdot T\cdot\mu_s\cdot\sin\left(\frac{\Delta\theta}{2}\right)-\Delta T\cdot\mu_s\cdot\sin\left(\frac{\Delta\theta}{2}\right)=0$$

$$\Delta T\cdot\cos\left(\frac{\Delta\theta}{2}\right)-\mu_s\cdot(2\cdot T+\Delta T)\cdot\sin\left(\frac{\Delta\theta}{2}\right)=0$$

$$\sum Fx=0$$

$$\frac{\Delta T}{\Delta\theta}\cdot\cos\left(\frac{\Delta\theta}{2}\right)-\mu_s\cdot\left(T+\frac{\Delta T}{2}\right)\cdot\frac{\sin\left(\frac{\Delta\theta}{2}\right)}{\frac{\Delta\theta}{2}}$$

$$\frac{dT}{d\theta}-\mu_s\cdot T=0 \qquad \frac{dT}{T}=\mu_s\cdot d\theta$$

$$\int_{T1}^{T2}\frac{1}{t}\,\mathrm{d}t=\int_0^{\beta}\mu_s\,\mathrm{d}\theta\rightarrow\begin{array}{l}\text{if } T1>0\vee 0>T2\\ \quad \ln(T2)-\ln(T1)\\ \text{else}\\ \quad undefined\end{array}=\beta\cdot\mu_s$$

$$\ln(T2)-\ln(T1)=\beta\cdot\mu_s\rightarrow\ln(T2)-\ln(T1)=\beta\cdot\mu_s$$

$$ln\left(\frac{T2}{T1}\right)=\beta\cdot\mu_s$$

$$e^{\ln\left(\frac{T2}{T1}\right)}=e^{\beta\cdot\mu_s}\rightarrow\frac{T2}{T1}=e^{\beta\cdot\mu_s}$$

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