sigma[x_] = ((2 * (muz + gx) * nu)/(K * (nu + muz + gx)))^0.5

f[x_] = −(Tx/(2 * (nu + muz + gx)))−

T

(((2/(K * nu))^0.5) * ((muz + gx)^1.5/(muz + nu + gx)^0.5)*

((sinh[x/sigma[x]])/(cosh[L/sigma[x]])))/(2 * (muz + nu + gx))

f′[x_]

f”[x_]

$$1.41421\left(\frac{\text{nu}(\text{muz}+gx)}{K(\text{muz}+\text{nu}+gx)}\right)^{0.5}$$

$$-\frac{Tx}{2(\text{muz}+\text{nu}+gx)}-$$

$$\frac{0.707107\left(\frac{1}{K\text{nu}}\right)^{0.5}T(\text{muz}+gx)^{1.5}\sinh\left[\frac{0.707107x}{\left(\frac{\text{nu}(\text{muz}+gx)}{K(\text{muz}+\text{nu}+gx)}\right)^{0.5}}\right]}{(\text{muz}+\text{nu}+gx)^{1.5}\cosh\left[\frac{0.707107L}{\left(\frac{\text{nu}(\text{muz}+gx)}{K(\text{muz}+\text{nu}+gx)}\right)^{0.5}}\right]}$$

$$\frac{gT\text{x}_-}{2(\text{muz}+\text{nu}+g\text{x}_-)^2}-$$

$$\frac{T}{2(\text{muz}+\text{nu}+g\text{x}_-)}+$$

$$\frac{1.06066g\left(\frac{1}{K\text{nu}}\right)^{0.5}T(\text{muz}+g\text{x}_-)^{1.5}\sinh\left[\frac{0.707107\text{x}_-}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right]}{\cosh\left[\frac{0.707107L}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right](\text{muz}+\text{nu}+g\text{x}_-)^{2.5}}-$$

$$\frac{1.06066g\left(\frac{1}{K\text{nu}}\right)^{0.5}T(\text{muz}+g\text{x}_-)^{0.5}\sinh\left[\frac{0.707107\text{x}_-}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right]}{\cosh\left[\frac{0.707107L}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right](\text{muz}+\text{nu}+g\text{x}_-)^{1.5}}-$$

$$\left(0.25L\left(\frac{1}{K\text{nu}}\right)^{0.5}T(\text{muz}+g\text{x}_-)^{1.5}\left(-\frac{g\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)^2}+\frac{g\text{nu}}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)\sinh\left[\frac{0.707107\text{x}_-}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right]\cosh'\left[\frac{0.707107L}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right]\right)/\left(\cosh\left[\frac{0.7071\text{C}}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right]\right)$$

$$\left(0.707107\left(\frac{1}{K\text{nu}}\right)^{0.5}T(\text{muz}+g\text{x}_-)^{1.5}\left(\frac{0.707107}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}-\frac{0.353553\text{x}_-\left(-\frac{g\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)^2}+\frac{g\text{nu}}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{1.5}}\right)\sinh'\left[\frac{0.707107\text{x}_-}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right]\right)/\left(\cosh\left[\frac{0}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{mu}}\right.\right.\right.$$

$$-\frac{g^2T\text{x}_-}{(\text{muz}+\text{nu}+g\text{x}_-)^3}+$$

$$\frac{gT}{(\text{muz}+\text{nu}+g\text{x}_-)^2}-$$

$$\frac{2.65165g^2\left(\frac{1}{K\text{nu}}\right)^{0.5}T(\text{muz}+g\text{x}_-)^{1.5}\sinh\left[\frac{0.707107\text{x}_-}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right]}{\cosh\left[\frac{0.707107L}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right](\text{muz}+\text{nu}+g\text{x}_-)^{3.5}}+$$

$$\frac{3.18198g^2\left(\frac{1}{K\text{nu}}\right)^{0.5}T(\text{muz}+g\text{x}_-)^{0.5}\sinh\left[\frac{0.707107\text{x}_-}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right]}{\cosh\left[\frac{0.707107L}{\left(\frac{\text{nu}(\text{muz}+g\text{x}_-)}{K(\text{muz}+\text{nu}+g\text{x}_-)}\right)^{0.5}}\right](\text{muz}+\text{nu}+g\text{x}_-)^{2.5}}-$$

$$\frac{0.53033g^2\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T\sinh\left[\frac{0.707107\mathrm{x\_}}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]}{\cosh\left[\frac{0.707107L}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right](\mathrm{muz}+g\mathrm{x\_})^{0.5}(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^{1.5}}-$$

$$\left(0.25L\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{1.5}\left(\frac{2g^2\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^3}-\frac{2g^2\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}\right)\sinh\left[\frac{0.707107\mathrm{x\_}}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\cosh'\left[\frac{0.707107L}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\right)/\left(\cosh\left[\frac{0.707107}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\right.}\right.\right.$$

$$\left(0.75gL\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{1.5}\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)\sinh\left[\frac{0.707107\mathrm{x\_}}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\cosh'\left[\frac{0.707107L}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\right)/\left(\cosh\left[\frac{0.707}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\right.}\right.\right.$$

$$\left(0.75gL\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{0.5}\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)\sinh\left[\frac{0.707107\mathrm{x\_}}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\cosh'\left[\frac{0.707107L}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\right)/\left(\cosh\left[\frac{0.707}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\right.}\right.\right.$$

$$\left(0.375L\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{1.5}\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^2\sinh\left[\frac{0.707107\mathrm{x\_}}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\cosh'\left[\frac{0.707107L}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\right)/\left(\cosh\left[\frac{0.70}{\left(\frac{\mathrm{nu}(\mathrm{muz}\right.}\right.\right.$$

$$\left(0.176777L^2\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{1.5}\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^2\sinh\left[\frac{0.707107\mathrm{x\_}}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\cosh'\left[\frac{0.707107L}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]^2\right)/\left(\cosh\left[\right.\right.$$

$$\left(2.12132g\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{1.5}\left(\frac{0.707107}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}-\frac{0.353553\mathrm{x\_}\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{1.5}}\right)\sinh'\left[\frac{0.707107\mathrm{x\_}}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\right)/\left(\cosh\left[\frac{0}{\left(\frac{\mathrm{nu}}{K(\mathrm{mu}\right.}\right.\right.$$

$$\left(2.12132g\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{0.5}\left(\frac{0.707107}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}-\frac{0.353553\mathrm{x\_}\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{1.5}}\right)\sinh'\left[\frac{0.707107\mathrm{x\_}}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\right)/\left(\cosh\left[\frac{0}{\left(\frac{\mathrm{nu}}{K(\mathrm{mu}\right.}\right.\right.$$

$$\left(0.707107\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{1.5}\left(-\frac{0.353553\mathrm{x\_}\left(\frac{2g^2\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^3}-\frac{2g^2\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}\right)}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{1.5}}-\frac{0.707107\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{1.5}}+\frac{0.53033\mathrm{x\_}\left(-\frac{g\mathrm{nu}(\mathrm{mu}\right.}{\left(\frac{\mathrm{nu}}{K(\mathrm{mu}\right.}\right.\right.$$

$$\left(0.5L\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{1.5}\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)\left(\frac{0.707107}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}-\frac{0.353553\mathrm{x\_}\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{1.5}}\right)\cosh'\left[\right.$$

$$\left(0.0883883L^2\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{1.5}\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^2\sinh\left[\frac{0.707107\mathrm{x\_}}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\cosh''\left[\frac{0.707107L}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\right)/\left(\cosh\left[\right.\right.$$

$$\left(0.707107\left(\frac{1}{K\mathrm{nu}}\right)^{0.5}T(\mathrm{muz}+g\mathrm{x\_})^{1.5}\left(\frac{0.707107}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}-\frac{0.353553\mathrm{x\_}\left(-\frac{g\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})^2}+\frac{g\mathrm{nu}}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{1.5}}\right)^2\sinh''\left[\frac{0.707107\mathrm{x\_}}{\left(\frac{\mathrm{nu}(\mathrm{muz}+g\mathrm{x\_})}{K(\mathrm{muz}+\mathrm{nu}+g\mathrm{x\_})}\right)^{0.5}}\right]\right)/\left(\cosh\left[\right.\right.$$