$$b = af$$
$$c = \sqrt{a^2 + b^2}$$

$$\begin{aligned}
t(f) &= \frac{c-a}{v_{Lisa}} - \frac{b}{v_{Bus}} \\
&= \frac{\sqrt{a^2+b^2}-a}{v_{Lisa}} - \frac{af}{v_{Bus}} \\
&= \frac{\sqrt{a^2(1+f^2)}-a}{v_{Lisa}} - \frac{af}{v_{Bus}} \\
&= a\left(\frac{\sqrt{1+f^2}-1}{v_{Lisa}} - \frac{f}{v_{Bus}}\right)
\end{aligned}$$

$$\begin{aligned}
\frac{dt(f)}{df} &= \frac{da\left(\frac{\sqrt{1+f^2}-1}{v_{Lisa}} - \frac{f}{v_{Bus}}\right)}{df} \\
&= a\left(\frac{d\frac{\sqrt{1+f^2}-1}{v_{Lisa}}}{df} - \frac{d\frac{f}{v_{Bus}}}{df}\right) \\
&= a\left(\frac{\frac{d\sqrt{1+f^2}}{df}}{v_{Lisa}} - \frac{\frac{df}{df}}{v_{Bus}}\right) \\
&= a\left(\frac{\frac{1}{2\sqrt{1+f^2}} \cdot \frac{d1+f^2}{df}}{v_{Lisa}} - \frac{1}{v_{Bus}}\right) \\
&= a\left(\frac{f}{v_{Lisa}\sqrt{1+f^2}} - \frac{1}{v_{Bus}}\right)
\end{aligned}$$

$$
\begin{aligned}
& & \frac{dt(f)}{df} &= 0 \\
&\iff & a\left(\frac{f}{v_{Lisa}\sqrt{1+f^2}} - \frac{1}{v_{Bus}}\right) &= 0 \\
&\iff & a\frac{f}{v_{Lisa}\sqrt{1+f^2}} &= a\frac{1}{v_{Bus}} \\
&\iff & \frac{f}{\sqrt{1+f^2}} &= \frac{v_{Lisa}}{v_{Bus}} \\
&\iff & \left(\frac{f}{\sqrt{1+f^2}}\right)^2 &= \left(\frac{v_{Lisa}}{v_{Bus}}\right)^2 \\
&\iff & \frac{f^2}{1+f^2} &= \frac{v_{Lisa}^2}{v_{Bus}^2} \\
&\iff & \frac{1+f^2}{f^2} &= \frac{v_{Bus}^2}{v_{Lisa}^2} \\
&\iff & \frac{1}{f^2} &= \frac{v_{Bus}^2 - v_{Lisa}^2}{v_{Lisa}^2} \\
&\iff & f^2 &= \frac{v_{Lisa}^2}{v_{Bus}^2 - v_{Lisa}^2} \\
&\iff & f &= \sqrt{\frac{v_{Lisa}^2}{v_{Bus}^2 - v_{Lisa}^2}} \\
&\iff & f &= \frac{v_{Lisa}}{\sqrt{v_{Bus}^2 - v_{Lisa}^2}}
\end{aligned}
$$