Stabilitätsanalyse des Algorithmus zur Berechnung von $y = f(x)$ basierend auf der Darstellung $y = \frac{1-\sqrt{1-x^2}}{x^2}$ für $|x|$ hinreichend klein

$$\kappa_1 = \left|\frac{x_1}{y}\frac{\partial\psi_1}{\partial x_1}(x_1)\right| \doteq \left|\frac{x_1}{y}\frac{1}{4}x_1\right| \doteq \frac{1}{2}x^2$$

$$\kappa_2 = \left|\frac{x_2}{y}\frac{\partial\psi_2}{\partial x_2}(x_2)\right| \doteq \left|\frac{x_2}{y}\frac{1}{8}\right| \doteq \frac{1}{4}x^2$$

$$\kappa_{31} = \left|\frac{x_{31}}{y}\frac{\partial\psi_3}{\partial x_{31}}(x_3)\right| = \left|\frac{x_{31}}{y}\frac{1}{x_{32}}\frac{1}{2\sqrt{x_{31}}}\right| \doteq \left|\frac{1}{\frac{1}{2}}\frac{1}{x^2}\frac{1}{2\sqrt{1}}\right| = \frac{1}{x^2}$$

$$\kappa_{32} = \left|\frac{x_{32}}{y}\frac{\partial\psi_3}{\partial x_{32}}(x_3)\right| = \left|\frac{x_{32}}{y}\frac{1-\sqrt{x_{31}}}{x_{32}^2}\right| \doteq \left|\frac{x^2}{\frac{1}{2}}\frac{\frac{1}{2}x^2}{x^4}\right| = 1$$

$$\kappa_{41} = \left|\frac{x_{41}}{y}\frac{\partial\psi_4}{\partial x_{41}}(x_4)\right| = \left|\frac{x_{41}}{y}\frac{1}{x_{42}}\right| \doteq \left|\frac{1}{\frac{1}{2}}\frac{1}{x^2}\right| = \frac{2}{x^2}$$

$$\kappa_{42} = \left|\frac{x_{42}}{y}\frac{\partial\psi_4}{\partial x_{42}}(x_4)\right| = \left|\frac{x_{42}}{y}\frac{1-x_{41}}{x_{42}^2}\right| = 1$$

$$\kappa_{51} = \left|\frac{x_{51}}{y}\frac{\partial\psi_5}{\partial x_{51}}(x_5)\right| = \left|\frac{x_{51}}{y}\frac{1}{x_{52}}\right| = 1$$

$$\kappa_{52} = \left|\frac{x_{52}}{y}\frac{\partial\psi_5}{\partial x_{52}}(x_5)\right| = \left|\frac{x_{52}}{y}\frac{x_{51}}{x_{52}^2}\right| = 1$$