

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

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

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

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

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

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

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

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

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