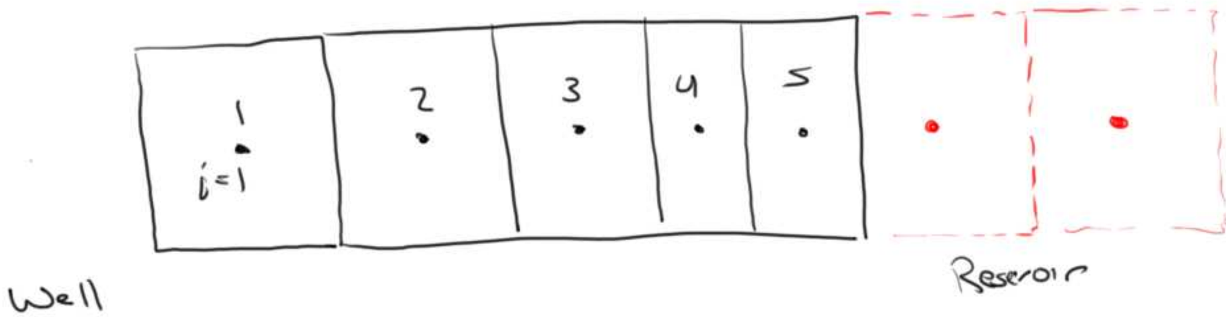
$$-\frac{1}{12\mu}\left[\frac{{w_{i+1}^{N+1}}^{3}-{w_{\cancel{i-1}}^{N+1}}^{3}}{\cancel{2}\Delta x}\cdot\frac{A_{(i+1)k}\,w_k^{N+1}-A_{(\cancel{i-1})k}\,w_k^{N+1}}{\cancel{2}\Delta x}+w_i^3\left[\frac{A^{i+2}_{\cancel{(i+1)k}}\,w_k^{N+1}-2\,A^{(i+1)}_{ik}\,w_k^{N+1}+A^{i}_{\cancel{(i-1)k}}\,w_k^{N+1}}{\Delta x^2}\right]\right]$$

$$+\frac{w_i^{N+1}-w_i^{N}}{\Delta t}+q_i=0$$



$$\overline{\overline{K}}(\vec{w})\vec{w}=\vec{Q}$$

$$\vec{w}=\overline{K}^{-1}\vec{Q}$$

Newton - Raphson

$$\vec{R} = \bar{\bar{K}}(\vec{W})\vec{W} - \vec{Q} = \vec{0}$$

$$\vec{R} = \vec{R}^n + \left(\frac{\partial \vec{R}}{\partial \vec{W}}\right)_n \left(\vec{W}^{n+1} - \vec{W}^n\right) + \frac{1}{2!}\left(\frac{\partial^2 \vec{R}}{\partial \vec{W}}\right)_n \left(\vec{W}^{n+1} - \vec{W}^n\right)^2 + \dots$$

$$\vec{0} \approx \vec{R}^n + K_T^n \Delta\vec{W} + \mathcal{O}(\Delta\vec{W}^2)$$

K_T is tangent stiffness $\Longrightarrow$ $K_T = \dfrac{\partial \vec{R}}{\partial \vec{W}}$ evaluated at $W = W^n$

$$\Delta\vec{W} = -(K_T)^{-1} R^n$$

$$\vec{W}^{n+1} = \vec{W}^n + \Delta\vec{W} \qquad \frac{\vec{W}^{n+1} - \vec{W}^n}{\vec{W}^{n+1}} < \text{tol} \quad \sim 10^{-6}$$