$$\boldsymbol{f}_n(\boldsymbol{x}) = \boldsymbol{A}_n\,\boldsymbol{x},\, \boldsymbol{f}_2(\boldsymbol{x}) = \boldsymbol{A}_2\,\boldsymbol{x},\, \boldsymbol{f}_1(\boldsymbol{x}) = \boldsymbol{A}_1\,\boldsymbol{x}$$

$$(\boldsymbol{f}_n \circ \ldots \circ \boldsymbol{f}_2 \circ \boldsymbol{f}_1)(\boldsymbol{x}) = \boldsymbol{A}_n \ldots \boldsymbol{A}_2 \boldsymbol{A}_1\,\boldsymbol{x} = \boldsymbol{A}\boldsymbol{x}$$

$$(\boldsymbol{f}_n \circ \ldots \circ \boldsymbol{f}_2 \circ \boldsymbol{\sigma} \circ \boldsymbol{f}_1)(\boldsymbol{x}) = \mathrm{DNN}(\boldsymbol{x})$$

$$\boldsymbol{A}_1 = [\ \boldsymbol{f}_1(\boldsymbol{e}_1) \quad \boldsymbol{f}_1(\boldsymbol{e}_m)\ ]$$

$$\boldsymbol{A} = [\ \boldsymbol{a}_1 \quad \ldots \quad \boldsymbol{a}_n\ ] = \boldsymbol{Q}\boldsymbol{R} = [\ \boldsymbol{q}_1 \quad \ldots \quad \boldsymbol{q}_n\ ] \begin{bmatrix} r_{11} & r_{12} & & \\ & r_{22} & & \\ & & & \\ & & & \end{bmatrix}, C(\boldsymbol{A}) = C(\boldsymbol{Q})$$

$$\boldsymbol{M}\ddot{\boldsymbol{y}} + \boldsymbol{D}\dot{\boldsymbol{y}} + \boldsymbol{K}\boldsymbol{y} = \boldsymbol{f}, \boldsymbol{y}, \boldsymbol{f} \in \mathbb{R}^m, m \gg 1$$

$$\boldsymbol{y} = \boldsymbol{B}\boldsymbol{z}, \boldsymbol{B} \in \mathbb{R}^{m \times n}, n \ll m, \boldsymbol{B}^T\boldsymbol{B} = \boldsymbol{I}$$

$$\boldsymbol{B}\boldsymbol{B}^T(\boldsymbol{M}\boldsymbol{B}\ddot{\boldsymbol{z}} + \boldsymbol{D}\boldsymbol{B}\dot{\boldsymbol{z}} + \boldsymbol{K}\boldsymbol{B}\boldsymbol{z}) = \boldsymbol{B}\boldsymbol{B}^T\boldsymbol{f} \Rightarrow$$

$$\boldsymbol{B}^T(\boldsymbol{M}\boldsymbol{B}\ddot{\boldsymbol{z}} + \boldsymbol{D}\boldsymbol{B}\dot{\boldsymbol{z}} + \boldsymbol{K}\boldsymbol{B}\boldsymbol{z}) = \boldsymbol{B}^T\boldsymbol{f} \Rightarrow$$

$$\boldsymbol{B}^T\boldsymbol{M}\boldsymbol{B}\ddot{\boldsymbol{z}} + \boldsymbol{B}^T\boldsymbol{D}\boldsymbol{B}\dot{\boldsymbol{z}} + \boldsymbol{B}^T\boldsymbol{K}\boldsymbol{B}\boldsymbol{z} = \boldsymbol{B}^T\boldsymbol{f}$$