V: $v_1, v_2, v_3, \dots, v_m \in V$

W: $w_1, w_2, w_3, \dots, w_n \in W$

$$x = \alpha_1 v_1 + \alpha_2 v_2 + \cdots + \alpha_m v_m$$

$$f(x) = \alpha_1 f(v_1) + \alpha_2 f(v_2) + \cdots + \alpha_m f(v_m)$$

$f(v_1) = \beta_{11} w_1 + \cdots + \beta_{n1} w_n$

$f(v_m) = \beta_{1m} w_1 + \cdots + \beta_{nm} w_n$

$$\begin{pmatrix} \beta_{11} & \cdots & \beta_{1m} \\ \vdots & & \vdots \\ \beta_{n1} & \cdots & \beta_{nm} \end{pmatrix} \begin{pmatrix} \alpha_1 \\ \vdots \\ \alpha_m \end{pmatrix} = \begin{pmatrix} \gamma_1 \\ \vdots \\ \gamma_n \end{pmatrix}$$

$$f(x) = \gamma_1 w_1 + \cdots + \gamma_n w_n$$

$f: V \to W$ $\quad g: W \to X$ both linear

$f(x) = Ax$ $\quad g(x) = Bx$

$g(f(x)) = B \cdot (A \cdot x)$