

Conversely,

$$\|D_1(f_1, f_2)\|^2 + \|D_2(f_1, f_2)\|^2 \leq M(\|v_1(f_1, f_2)\|^2 + \|v_2(f_1, f_2)\|^2)$$

$$\text{for, } \begin{aligned} D_1 &= a_{11} v_1 + a_{21} v_2 \\ D_2 &= a_{12} v_1 + a_{22} v_2 \end{aligned}$$

$$D_1(f_1, f_2) = a_{11} v_1(f_1, f_2) + a_{21} v_2(f_1, f_2)$$

$$\|D_1(f_1, f_2)\|^2 = \|(a_{11} v_1(f_1), a_{11} v_1(f_2)) + (a_{21} v_2(f_1), a_{21} v_2(f_2))\|^2$$

$$= \|(a_{11} v_1(f_1) + a_{21} v_2(f_1), a_{11} v_1(f_2) + a_{21} v_2(f_2))\|^2$$

$$= |a_{11} v_1(f_1) + a_{21} v_2(f_1)|^2 + |a_{11} v_1(f_2) + a_{21} v_2(f_2)|^2$$

$$\leq 2|a_{11} v_1(f_1)|^2 + 2|a_{21} v_2(f_1)|^2 + 2|a_{11} v_1(f_2)|^2 + 2|a_{21} v_2(f_2)|^2$$

$$= 2(|a_{11} v_1(f_1)|^2 + |a_{11} v_1(f_2)|^2 + |a_{21} v_2(f_1)|^2 + |a_{21} v_2(f_2)|^2)$$

$$\leq M(|v_1(f_1)|^2 + |v_1(f_2)|^2 + |v_2(f_1)|^2 + |v_2(f_2)|^2)$$

$$= M(\|(v_1(f_1), v_1(f_2))\|^2 + \|(v_2(f_1), v_2(f_2))\|^2)$$

$$= M(\|v_1(f_1, f_2)\|^2 + \|v_2(f_1, f_2)\|^2)$$

On the other hand,

$$\|V(f_1, f_2)\|^2 = |v_1(f_1) + f_\beta \theta_{\beta_1}(v_1)|^2 + |v_2(f_1) + f_\beta \theta_{\beta_1}(v_2)|^2 \\ + |v_1(f_2) + f_\beta \theta_{\beta_2}(v_1)|^2 + |v_2(f_2) + f_\beta \theta_{\beta_2}(v_2)|^2$$

$$|v_1(f_1)|^2 = |v_1(f_1) + f_\beta \theta_{\beta_1}(v_1) - f_\beta \theta_{\beta_1}(v_1)|^2$$

$$\leq 2|v_1(f_1) + f_\beta \theta_{\beta_1}(v_1)|^2 + 2|f_\beta \theta_{\beta_1}(v_1)|^2$$

$$\leq 2|v_1(f_1) + f_\beta \theta_{\beta_1}(v_1)|^2 + 2M\|f\|^2$$

$$\leq 2|v_1(f_1) + f_\beta \theta_{\beta_1}(v_1)|^2$$

$$+ 2M\|f\|^2$$

$$\leq C'(|v_1(f_1) + f_\beta \theta_{\beta_1}(v_1)|^2 + \|f\|^2)$$