

Werk

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Since $e = B_1 e$, we obtain that

$$e = B_1 e = (e, B_1^* v) e = \alpha(e, e) e$$

and hence

$$\alpha = \frac{1}{(e, e)}.$$

Similarly, there is a vector $u \in \mathcal{H}$ such that $u = B_1 u = \beta e$ and

$$B_1^* x = (x, u) B_1^* e.$$

Further

$$v = B_1^* v = \alpha e = (\alpha e, \beta e) B_1^* e,$$

and we obtain that

$$\beta = \alpha$$

and finally

$$B_1^* x = (x, \beta B_1 e) B_1^* e = (x, \alpha B_1^* e) B_1 e = B_1 x$$

and this concludes the proof.

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