

Werk

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SUB Göttingen
Platz der Göttinger Sieben 1
37073 Göttingen

✉ info@digizeitschriften.de

The right hand side in (15) can be rewritten by means of the identity

$$(29) \quad \begin{aligned} (\Phi^2 u^e)_{-h} - \Phi^2 u^e &= \Phi_{-h}^2 (u_{-h}^e - u^e) + (\Phi_{-h}^2 - \Phi^2) u^e = \\ &= (\Phi_{-h}^2 - \Phi^2) (u_{-h}^e - u^e) + \Phi^2 (u_{-h}^e - u^e) + (\Phi_{-h}^2 - \Phi^2) u^e. \end{aligned}$$

The functions $\Delta_{-h}(\Phi^2)$, Φ , Φ^2 are bounded independently of h . Moreover, it is easy to see that for $f \in [L_2(\Omega)]^m$ we have $\Delta_{-h}(f) \rightarrow \partial f / \partial x_i$ in the dual space $([W_2^1(\Omega^*)]^m)^*$. Especially, $\Delta_{-h}(f)$ are bounded in this space.

It follows from here and from (29) that the absolute value of the right hand side in (15) is not greater than

$$c_{17} (\|\Delta_{-h}(u^e) \Phi\|_{2,1,\Omega} + \|u^e\|_{2,1,\Omega}) h^2 \leq c_{18} \|\Delta_{-h}(u^e) \Phi\|_{2,1,\Omega} h^2.$$

Now all the estimates proved yield together the inequality (16). The proof of the theorem is complete.

References

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Authors' address: 115 67 Praha 1, Žitná 25 (Matematický ústav ČSAV).