# Numerical Partial Differential Equations

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- page 222, exercise #7: The Fromm slope should have a minus (not a plus):

  > with $a > 0$. Using the REA algorithm (see Algorithm 6.1), consider the Fromm slope
  >
  > $$\delta_{k,\ell} = \frac{1}{2}(u_{k+1,\ell} - u_{k-1,\ell}).$$

- page 401, last paragraph: The notation here is inconsistent, introducting $\phi_{q,k}(x)$, which later becomes $\phi_{k,q}(x)$. The latter notation is more consistent:

  > For $v(x) \in \mathcal{V}^{h_x}$, the restriction to each element, $v_k(x)$, is a polynomial of degree at most $p$. Here, we consider a *nodal* representation of the polynomial, writing $v_k(x)$ in element $\Omega_k$ in terms of a nodal basis, $\{\phi_{k,q}(x)\}_{q=0}^{p}$, where the basis functions, $\phi_{k,q}(x)$, satisfy $\phi_{k,q}(x_{k,j}) = \delta_{q,j}$ at the $p+1$ interpolation points, $x_{k,0}, \ldots, x_{k,p}$, in element $\Omega_k$, as shown in Figure 9.5.2. The nodal basis functions $\phi_{k,q}(x)$ are given by the Lagrange polynomials.

- page 402, line 9: Missing $\widehat{\ }$ on $\phi_q$:

  > the nodes $x_{k,q} \in \Omega_k$, $\phi_{k,q}(x)$, are related as $\phi_{k,q}(F_k(\widehat{x})) = \widehat{\phi}_q(\widehat{x})$.

- page 402, two lines after (9.157): The function $u^{h_x}$ should just be $u$:

  > equivalent, since we use the parts of $u$ and $v$ that are restricted to $\Omega_k$, and are,. . .

- page 404, eqn. (9.165): The function $\boldsymbol{z}$ should depend on $\boldsymbol{u}_{k-1}$ and $\boldsymbol{u}_{k+1}$ in addition to $\boldsymbol{u}_k$:

  > $$\begin{aligned} M\frac{d\boldsymbol{u}_k}{dt} &= \frac{2}{h_x}\left(K\boldsymbol{f}_k(\boldsymbol{u}_k) + f^*(u_{k-1,p}, u_{k,0})\boldsymbol{\delta}_0 - f^*(u_{k,p}, u_{k+1,0})\boldsymbol{\delta}_p\right), \\ &=: -\boldsymbol{z}(\boldsymbol{u}_{k-1}, \boldsymbol{u}_k, \boldsymbol{u}_{k+1}), \end{aligned}$$

- page 410, eqn. (9.187): The sign on the exponent should be positive, not negative:

  > $$\widetilde{f}_{q,q} = \begin{cases} 1 & \text{for } q < p_{\text{cutoff}}, \\ e^{\alpha\left(\frac{q+1-p_{\text{cutoff}}}{p+1-p_{\text{cutoff}}}\right)^{2s}} & \text{for } q \geq p_{\text{cutoff}}, \end{cases}$$

- page 563, ref. [2]: The term “editors” should be removed from the citation:

R. A. ADAMS AND J. J. F. FOURNIER, *Sobolev Spaces*, vol. 140 of Pure and Applied Mathematics, Elsevier/Academic Press, second ed., 2003, https://www.sciencedirect.com/bookseries/pure-and-applied-mathematics/vol/140.