Notations

C	positive constants in estimates, which may change their value from term to term.
t^+	$\max\{t,0\}$ for $t \in \mathbb{R}$.
t^-	$\max\{-t,0\}$ for $t \in \mathbb{R}$.
$a_k \sim b_k$	$\lim\limits_{k\to\infty} \frac{a_k}{b_k} = 1$.
$\mathbb{N}$	$= \{0,1,2,3\ldots\}$.
$\mathbb{N}^+$	$= \{1,2,3\ldots\}$.
n	space dimension.
$\mathbb{R}^n_+$	$= \{x \in \mathbb{R}^n : x_1 > 0\}$, half space.
Ω	domain, an open and connected subset of $\mathbb{R}^n$.
$\partial\Omega$	$\overline{\Omega} \cap \overline{\mathbb{R}^n \setminus \Omega}$, the boundary of Ω.
$\Omega_0 \subset\subset \Omega$	$\overline{\Omega_0}$ is compact and $\overline{\Omega_0} \subset \Omega$.
A^c	for $A \subset \Omega$: complement of A in Ω, $\Omega \setminus A$.
$d\omega$	surface element for $\partial\Omega$.
ν	exterior unit normal at $\partial\Omega$.
$B_r(x)$	open ball with radius r and centre x.
B	$= B_1(0)$, open unit ball in $\mathbb{R}^n$.
$\mathbb{S}^{n-1}$	$= \partial B \subset \mathbb{R}^n$, unit sphere.
e_n	$= \dfrac{\pi^{n/2}}{\Gamma(1+n/2)}$, volume of the n-dimensional unit ball $B \subset \mathbb{R}^n$. So ne_n is the $(n-1)$-dimensional measure of the unit sphere.

$d(x)$	$= \operatorname{dist}(x, \partial\Omega)$, for $x \in \Omega$.
$d(x)$	$= 1 - \lvert x\rvert$, for $x \in B$.
$[XY]$	$= \left\lvert \lvert x\rvert y - \frac{x}{\lvert x\rvert} \right\rvert$, for $x, y \in B$.
r	$= \lvert x\rvert$, $x \in \mathbb{R}^n$.
$D_{i_1,\dots,i_k}$	$= \dfrac{\partial^k}{\partial x_{i_1} \cdots \partial x_{i_k}}$.
α, β	multiindices $\in \mathbb{N}_0^n$, $\lvert\alpha\rvert = \sum_{i=1}^n \alpha_i$.
D^α	$= \prod_{i=1}^n \left(\dfrac{\partial}{\partial x_i}\right)^{\alpha_i}$ with $\lvert\alpha\rvert = \sum_{i=1}^n \alpha_i$.
$C_c^\infty(\Omega)$	space of $C^\infty(\Omega)$-functions having compact support in Ω.
$W^{m,p}(\Omega)$	Sobolev space of the m-times weakly differentiable functions in Ω with L^p-derivatives.
$D^k u \cdot D^k v$	$= \sum_{i_1,\dots,i_k=1}^n \dfrac{\partial^k u}{\partial x_{i_1} \dots \partial x_{i_k}} \cdot \dfrac{\partial^k v}{\partial x_{i_1} \dots \partial x_{i_k}}$.
$\lvert D^k u\rvert$	$= \left(D^k u \cdot D^k u\right)^{1/2}$.
$\lVert u\rVert_{W^{m,p}}$	$= \left(\lVert u\rVert^p_{L^p(\Omega)} + \lVert D^m u\rVert^p_{L^p(\Omega)}\right)^{1/p}$.
$\lVert u\rVert_{W_0^{m,p}}$	$= \lVert D^m u\rVert_{L^p(\Omega)}$.
$W_0^{m,p}(\Omega)$	in bounded domains Ω, closure of $C_c^\infty(\Omega)$ with respect to the norm $\lVert\,.\,\rVert_{W_0^{m,p}}$.
$W_0^{m,p}(\Omega)$	in any domain Ω, closure of $C_c^\infty(\Omega)$ with respect to the norm $\lVert\,.\,\rVert_{W^{m,p}}$.
$\mathscr{D}^{m,p}(\Omega)$	in unbounded domains Ω, closure of $C_c^\infty(\Omega)$ with respect to the norm $\lVert\,.\,\rVert_{W_0^{m,p}}$.
$H^m(\Omega)$	$= W^{m,2}(\Omega)$.
$H_0^m(\Omega)$	$= W_0^{m,2}(\Omega)$.
$H_\vartheta^m(\Omega)$	$= \left\{v \in H^m(\Omega);\ \Delta^j v = 0 \text{ on } \partial\Omega \text{ for } j < \dfrac{m}{2}\right\}$.
$H^{-m}(\Omega)$	dual space $(H_0^m(\Omega))'$.

$\Vert u \Vert^2_{H_0^m}$	$= \sum_{i_1,\dots,i_m=1}^{n} \int_\Omega \vert D_{i_1,\dots,i_m} u \vert^2 \, dx \ = \text{(see (2.12))}$
	$= \begin{cases} \int_\Omega \left(\Delta^{m/2} u \right)^2 dx & \text{if } m \text{ is even,} \\ \int_\Omega \left\vert \nabla \Delta^{(m-1)/2} u \right\vert^2 dx & \text{if } m \text{ is odd.} \end{cases}$
$(\, . \, , \, . \,)_{H_0^m}$	corresponding scalar product in $H_0^m(\Omega)$.
$\Vert u \Vert^2_{\mathscr{D}^{m,2}}$	$= \begin{cases} \int_\Omega \left(\Delta^{m/2} u \right)^2 dx & \text{if } m \text{ is even,} \\ \int_\Omega \left\vert \nabla \Delta^{(m-1)/2} u \right\vert^2 dx & \text{if } m \text{ is odd.} \end{cases}$
$(\, . \, , \, . \,)_{\mathscr{D}^{m,2}}$	corresponding scalar product in $\mathscr{D}^{m,2}$.
$\langle f, u \rangle$	dual pairing: $u \in$ Banach space, $f \in$ its dual.
$\Lambda_{m,j}$	j-th Dirichlet-eigenvalue of $(-\Delta)^m$, according to its multiplicity.
φ_j	corresponding eigenfunctions, orthonormal in $H_0^m(\Omega)$.
$G_{m,n}, \mathscr{G}_{m,n}$	Green's function, Green's operator, resp. for $(-\Delta)^m$ under Dirichlet boundary conditions in $B \subset \mathbb{R}^n$.
$G_{(-\Delta)^m,\Omega}, \mathscr{G}_{(-\Delta)^m,\Omega}$	the same for $\Omega \subset \mathbb{R}^n$.
$G_{m,n,\mathscr{A}}, \mathscr{G}_{m,n,\mathscr{A}}$	the same for $(-\Delta)^m + \mathscr{A}$ in $B \subset \mathbb{R}^n$, where $\mathscr{A} u = \sum_{\vert\alpha\vert \le 2m-1} a_\alpha D^\alpha u$.
$G_{(-\Delta)^m,\Omega,\mathscr{A}}, \mathscr{G}_{(-\Delta)^m,\Omega,\mathscr{A}}$	the same in $\Omega \subset \mathbb{R}^n$.
s	$= \dfrac{n+2m}{n-2m}$, for $n > 2m$; critical Sobolev exponent.

For measurable functions f, g:

$f > 0$	$f(x) > 0$ for almost all x.
$f > g$	$f - g > 0$.
$f \not\geq 0$	$f(x) < 0$ for x in a set of positive measure.
$f \not\geq g$	$f - g \not\geq 0$.
$f \gneqq 0$	$f(x) \neq 0$ for x in a set of positive measure and $f(x) \geq 0$ for almost all x.
$f \gneqq g$	$f - g \gneqq 0$.
$f(t) \simeq g(t)$	$\exists C > 0 \ \forall t : \quad \frac{1}{C} f(t) \le g(t) \le C f(t)$; for $f, g \ge 0$.
$f(t) \preceq g(t)$	$\exists C > 0 \ \forall t : \quad f(t) \le C g(t)$, for $f, g \ge 0$.
Ω^*	a ball centered at the origin such that $\vert\Omega\vert = \vert\Omega^*\vert$.

u^*	spherical rearrangement of a measurable function u, see Definition 3.10.
$(g_{ij})_{i,j=1,\dots,n}$	Riemannian metric, positive definite tensor. In case of parametrisations X in $\mathbb{R}^3$ over a two dimensional parameter domain: $g_{ij} = \partial_i X \cdot \partial_j X$.
g	$= \det\left((g_{ij})_{i,j=1,\dots,n}\right)$, Gram's determinant.
$(g^{ij})_{i,j=1,\dots,n}$	inverse of the metric tensor.
$(L_{ij})_{i,j=1,\dots,n}$	second fundamental form. In case of parametrisations X in $\mathbb{R}^3$ over a two dimensional parameter domain: $$L_{ij} = \frac{1}{\sqrt{g}} \det(\partial_i\partial_j X, \partial_1 X, \partial_2 X).$$
$\mathtt{H}$	mean curvature. In case of parametrisations X in $\mathbb{R}^3$ over a two dimensional parameter domain: $$\mathtt{H} = \frac{1}{2}\sum_{i,j=1}^{2} g^{ij}L_{ij} = \frac{1}{2g}(g_{22}L_{11} - 2g_{12}L_{12} + g_{11}L_{22}).$$
$\mathtt{K}$	Gaussian curvature. In case of parametrisations X in $\mathbb{R}^3$. over a two dimensional parameter domain: $$\mathtt{K} = \frac{\det\left((L_{ij})_{i,j=1,2}\right)}{g}.$$
Γ_{ij}^k	$= \sum_{\ell=1}^{n} \frac{1}{2} g^{k\ell}\left(\partial_j g_{i\ell} + \partial_i g_{j\ell} - \partial_\ell g_{ij}\right)$, Christoffel symbols.
$R_{kij}^{\ell} = -R_{kji}^{\ell}$	$= \partial_i \Gamma_{jk}^{\ell} - \partial_j \Gamma_{ik}^{\ell} + \sum_{m=1}^{n}\left(\Gamma_{im}^{\ell}\Gamma_{jk}^{m} - \Gamma_{jm}^{\ell}\Gamma_{ik}^{m}\right)$, Riemannian curvature tensor.
$R_{k\ell ij} = -R_{\ell kij} = R_{ijk\ell}$	$= \sum_{m=1}^{n} g_{km} R_{\ell ij}^{m}$.
R_{ij}	$= \sum_{k,\ell=1}^{n} g^{k\ell} R_{ikj\ell} = \sum_{k=1}^{n} R_{ikj}^{k}$, Ricci tensor.
R	$= \sum_{i,j=1}^{n} g^{ij} R_{ij}$, scalar curvature.
S_{ij}	$= \frac{1}{n-2}\left(2R_{ij} - \frac{R}{(n-1)} g_{ij}\right)$, Schouten tensor.
$W_{ijk\ell}$	$= R_{ijk\ell} - \frac{1}{n-2}\left(R_{ik}g_{j\ell} - R_{i\ell}g_{jk} + R_{j\ell}g_{ik} - R_{jk}g_{i\ell}\right) + \frac{R}{(n-1)(n-2)}\left(g_{j\ell}g_{ik} - g_{jk}g_{i\ell}\right)$, Weyl tensor.

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   Monograph manuscripts should be reasonably self-contained and rounded off. Thus they may, and often will, present not only results of the author but also related work by other people. They may be based on specialised lecture courses. Furthermore, the manuscripts should provide sufficient motivation, examples and applications. This clearly distinguishes Lecture Notes from journal articles or technical reports which normally are very concise. Articles intended for a journal but too long to be accepted by most journals, usually do not have this "lecture notes" character. For similar reasons it is unusual for doctoral theses to be accepted for the Lecture Notes series, though habilitation theses may be appropriate.

2. Manuscripts should be submitted either to Springer's mathematics editorial in Heidelberg, or to one of the series editors. In general, manuscripts will be sent out to 2 external referees for evaluation. If a decision cannot yet be reached on the basis of the first 2 reports, further referees may be contacted: The author will be informed of this. A final decision to publish can be made only on the basis of the complete manuscript, however a refereeing process leading to a preliminary decision can be based on a pre-final or incomplete manuscript. The strict minimum amount of material that will be considered should include a detailed outline describing the planned contents of each chapter, a bibliography and several sample chapters.

   Authors should be aware that incomplete or insufficiently close to final manuscripts almost always result in longer refereeing times and nevertheless unclear referees' recommendations, making further refereeing of a final draft necessary.

   Authors should also be aware that parallel submission of their manuscript to another publisher while under consideration for LNM will in general lead to immediate rejection.

3. Manuscripts should in general be submitted in English. Final manuscripts should contain at least 100 pages of mathematical text and should always include

   – a table of contents;
   – an informative introduction, with adequate motivation and perhaps some historical remarks: it should be accessible to a reader not intimately familiar with the topic treated;
   – a subject index: as a rule this is genuinely helpful for the reader.

   For evaluation purposes, manuscripts may be submitted in print or electronic form, in the latter case preferably as pdf- or zipped ps-files. Lecture Notes volumes are, as a rule, printed digitally from the authors' files. To ensure best results, authors are asked to use the LaTeX2e style files available from Springer's web-server at:

   ftp://ftp.springer.de/pub/tex/latex/svmonot1/ (for monographs).

Additional technical instructions, if necessary, are available on request from: lnm@springer.com.

4. Careful preparation of the manuscripts will help keep production time short besides ensuring satisfactory appearance of the finished book in print and online. After acceptance of the manuscript authors will be asked to prepare the final LaTeX source files (and also the corresponding dvi-, pdf- or zipped ps-file) together with the final printout made from these files. The LaTeX source files are essential for producing the full-text online version of the book (see www.springerlink.com/content/110312 for the existing online volumes of LNM).

   The actual production of a Lecture Notes volume takes approximately 12 weeks.

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