THIS IS THE LONG TITLE

AUTHOR 1 AND AUTHOR 2

Abstract. Abstract goes here. The total length of the abstract should not exceed 15 lines. In order to render the abstract in HTML, the use of mathematical symbols should be minimised. The abstract should not included numbered equations, theorems, references etc. If a reference is considered essential then it should be included in full. See for example [S. Prößdorf, and A. Rathsfeld, A spline collocation method for singular integral equations with piecewise continuous coefficients, *Integral Equations Oper. Theory*, 7 (1984), 536-560.]

1. Introduction

A few points to note:

- All objects (equations, theorems, sections, figures, tables etc) should be referenced via the commands `\label, \ref, \cite`. In addition, they should be referred to as 'Figure, Table, Section' etc. as in '`... see Figure~\ref{fig1}`' (equation should appear in lowercase).
- Tables and figures must have a caption and be centred.
- We prefer figures in EPS or PDF format. We do accept the bitmap formats JPG and PNG if the resolution is suitable for high-definition printing.
- The bibliography should follow the style given here.
- The use of footnotes should be minimized.

This is section 1. We list a few common environments and show the use of `\label`, `\ref` and `\cite` to reference objects.

Theorem 1.1.

$$\left| f(x) - f(a) + (x-a)f'(a) + \frac{1}{2}(x-a)^2 f''(a) \right| < \epsilon. \tag{1.1}$$

Proof. Proof of Theorem 1.1 involves equation (1.1) and the results of [1]. □

2. Moments

3. Preliminaries

In the next section weighted (or product) integral inequalities are constructed. The weight function (or density) is assumed to be non-negative and integrable over its entire domain. The following generic quantitative measures of the weight are defined.

Definition 3.1. Let $w : (a,b) \to [0,\infty)$ be an integrable function, i.e. $\int_a^b w(t)\,dt < \infty$, then define

$$m_i(a,b) = \int_a^b t^i w(t)\,dt, \qquad i = 0, 1, \ldots \tag{3.1}$$

as the i^{th} *moment* of w.

2000 *Mathematics Subject Classification.* 26D15.
Key words and phrases. keyword1, keyword2.

n	Error (1)	Error (2)	Error (3)	Error ratio (3)	Bound ratio (3)
4	1.97(0)	2.38(0)	2.48(0)	–	–
8	3.41(-1)	2.93(-1)	2.35(-1)	10.56	3.90
16	8.63(-2)	5.68(-2)	2.62(-2)	8.97	3.95
32	2.37(-2)	1.31(-2)	4.34(-3)	6.04	3.97
64	6.58(-3)	3.20 (-3)	9.34(-4)	4.65	3.99
128	1.82(-3)	7.94(-4)	2.23(-4)	4.18	3.99
256	4.98(-4)	1.98(-4)	5.51(-5)	4.05	4.00

Table 3.1: The error in evaluating (3.4) using different quadrature rules. The parameter n is the number of sample points.

Definition 3.2. Define the *mean* of the interval $[a, b]$ with respect to the density w as

$$\mu(a,b) = \frac{m_1(a,b)}{m_0(a,b)} \tag{3.2}$$

and the *variance* by

$$\sigma^2(a,b) = \frac{m_2(a,b)}{m_0(a,b)} - \mu^2(a,b). \tag{3.3}$$

Equation 3.1 appears in Definition 3.1 of Section 2. Table and figures should have captions and be centred. As in Table 3.1 and Figure 4.1

$$\int_0^1 100t\ln(1/t)\cos(4\pi t)\,dt = -1.972189325199166 \tag{3.4}$$

4. Stokes flow

The governing equations are the (dimensionless) Stokes flow equations

$$\nabla p = \nabla^2 \boldsymbol{v}, \qquad \nabla\cdot\boldsymbol{v} = 0, \tag{4.1}$$

$$\nabla \hat{p} = \lambda\nabla^2 \hat{\boldsymbol{v}}, \qquad \nabla\cdot\hat{\boldsymbol{v}} = 0, \tag{4.2}$$

where λ is the ratio of the viscosity of the interior fluid to that of the exterior fluid, $(\boldsymbol{v}, p)$ are the velocity and pressure fields in the exterior fluid, and $(\hat{\boldsymbol{v}}, \hat{p})$ are the velocity and pressure fields in the interior fluid.

The boundary conditions are that the velocity and tangential stress are continuous across the interface, and the normal stress at the interface is balanced by a surface tension force. These give

$$\boldsymbol{v} = \hat{\boldsymbol{v}} \qquad \text{and} \qquad \Delta\boldsymbol{f} = -z\boldsymbol{n} + \Gamma(\nabla\cdot\boldsymbol{n})\boldsymbol{n} \tag{4.3}$$

where $\Delta\boldsymbol{f}$ is the difference in stress forces across the drop surface, Γ is the inverse Bond number which is directly proportional to the surface tension and $\boldsymbol{n}$ is the normal vector to the drop surface, pointing from the exterior fluid to the interior fluid. The term $\nabla\cdot\boldsymbol{n}$ is the mean curvature of the surface of a drop and $z\boldsymbol{n}$ represents a common buoyancy term which has been subtracted from the pressure fields.

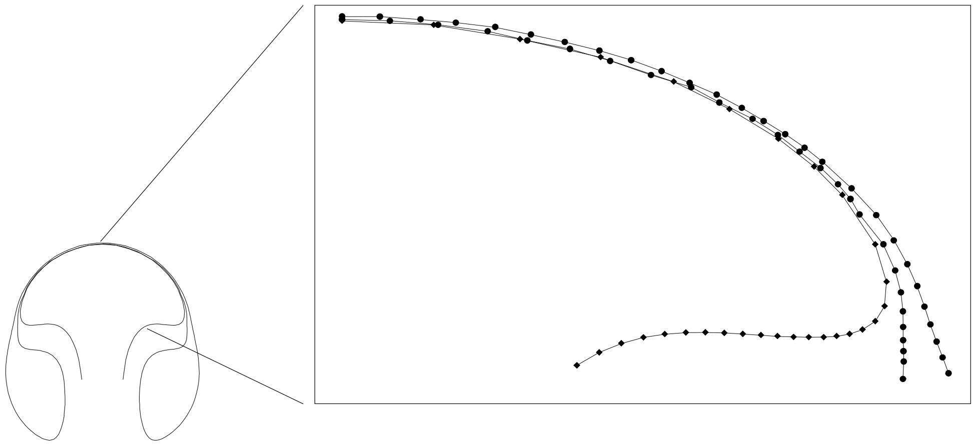

Figure 4.1: Two-drop simulation. A magnified view of the top surface showing the migration of the marker points into the drop interior.

The boundary integral representation of these equations, described in detail in [5], is given by

$$v_k(\boldsymbol{x}) = \frac{1}{4\pi(1+\lambda)} \int_S G_{ik}(\boldsymbol{x}-\boldsymbol{y})\Delta f_i(\boldsymbol{y})\, dS_y + \frac{3}{2\pi}\left(\frac{1-\lambda}{1+\lambda}\right) \int_S S_{ijk}(\boldsymbol{x}-\boldsymbol{y}) v_i(\boldsymbol{y}) n_j(\boldsymbol{y})\, dS_y, \tag{4.4}$$

where $\boldsymbol{x}, \boldsymbol{y} \in S = S_1 \cup S_2 \cup \ldots$.

The quantities G_{ij} and S_{ijk} are the Greens functions defined by

$$G_{ij} = \frac{\delta_{ij}}{r} + \frac{r_i r_j}{r^3} \qquad \text{and} \qquad S_{ijk} = \frac{-r_i r_j r_k}{r^5}, \qquad \text{where} \quad \boldsymbol{r} = \boldsymbol{x} - \boldsymbol{y}. \tag{4.5}$$

References

[1] K. ADEROGBA and J.R. BLAKE, Action of a force near a planar surface between two semi-infinite immiscible liquids at very low Reynolds numbers. Addendum, *Bull. Austral. Math. Soc.*, **19** (1978), 309–318.

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