

# Abstract

We consider the stability of symmetric flows in a two-dimensional channel (including the Poiseuille flow). In 2015 Grenier, Guo, and Nguyen have established instability of these flows in a particular region of the parameter space, affirming formal asymptotics results from the 1940s. We prove that these flows are stable outside this region in parameter space. More precisely, we show that the Orr–Sommerfeld operator

$$\mathcal{B} = \left( -\frac{d^2}{dx^2} + i\beta(U + i\lambda) \right) \left( \frac{d^2}{dx^2} - \alpha^2 \right) - i\beta U'',$$

which is defined on

$$D(\mathcal{B}) = \{u \in H^4(0, 1), u'(0) = u^{(3)}(0) = 0 \text{ and } u(1) = u'(1) = 0\}$$

is bounded on the half-plane  $\Re \lambda \geq 0$  for  $\alpha \gg \beta^{-1/10}$  or  $\alpha \ll \beta^{-1/6}$ .

*Keywords.* hydrodynamic stability, Orr–Sommerfeld, Poiseuille, non-self-adjoint

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