

# Instability in Geophysical Flows

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## Addenda

Additional homework exercises for Chapter 4:

1. Derive (4.40), the dispersion relation for the Taylor-Caulfield instability, and solve numerically to reproduce figure 4.13. Confirm the simplified solution for the limit  $kh \rightarrow \infty$ .
2. Derive and plot the dispersion relation for the Taylor instability:

$$U(z) = u_0 \begin{cases} 1, & z \geq h \\ z/h, & -h < z < h \\ -1, & z \leq -h \end{cases} \quad \text{and} \quad B(z) = b_0 \begin{cases} 1, & z \geq h \\ 0, & -h < z < h \\ -1, & z \leq -h \end{cases}$$

(Optional) Investigate the mechanism in terms of resonating vorticity and gravity waves.