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11 November 2019

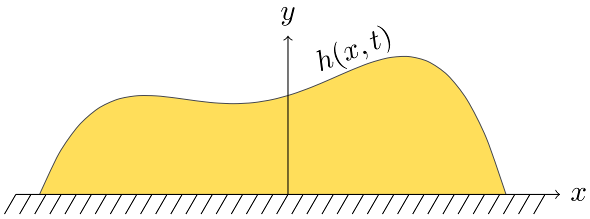


Figure 1: Beer spilled on a table.

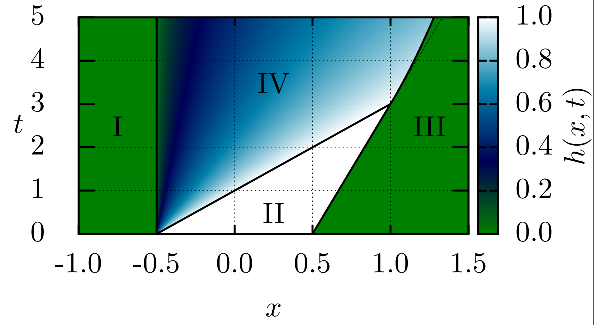


Figure 2: $\alpha = \pi/6$

$$\rho\left(\frac{\partial \mathbf{u}}{\partial t} + (\mathbf{u}\cdot\nabla)\mathbf{u}\right) = -\nabla p + \mu\nabla^2\mathbf{u} + \rho\mathbf{g}$$

# 1 2d

$$\frac{\partial h}{\partial t} = \frac{1}{3}\nabla\cdot\left(h^3\nabla h\right) \tag{1}$$

$$\int_{\mathbb{R}} h\,\mathrm{d}x \tag{2}$$

$h(x,t) = t^\alpha f(\eta)$ where $\eta = xt^{-\beta}$
$\alpha = -1/5$ $\beta = 1/5$

$$\frac{-3}{5}(\eta f' + f) = \left(f^3 f\right)'$$

$$f = \left(\frac{9}{10}\right)^{1/3}\left(\eta_*^2 - \eta^2\right)^{1/3}$$

$$\eta_* = \left(\frac{6075\Gamma^6\left(\frac{2}{3}\right)\Gamma^6\left(\frac{11}{6}\right)}{16\pi^9}\right)^{1/10}$$
$$\approx 0.747412$$

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# 2 Polar

solve (1) and (2) in polar
$\alpha = -1/4$ $\beta = 1/8$

$$\frac{-3}{8}\left(2\eta f + \eta^2 f'\right) = \left(\eta f^3 f'\right)'$$

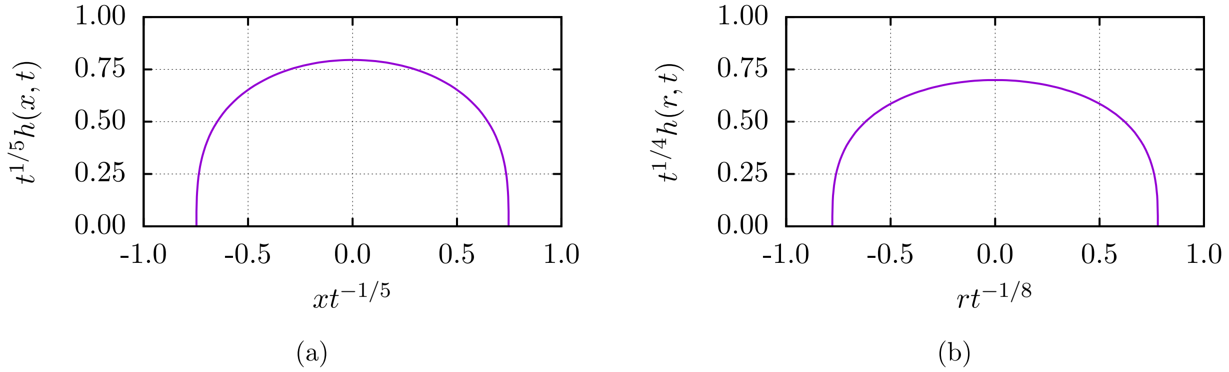


Figure 3

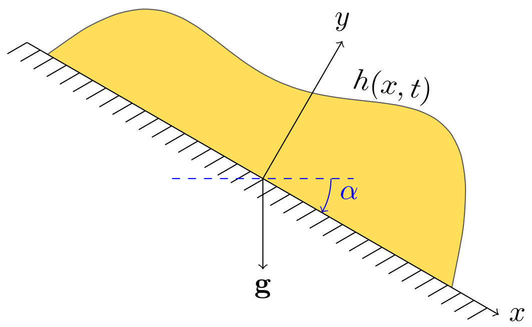


Figure 4: Beer spilled on a crooked table.

$$f = \left(\frac{9}{16}\right)^{1/3} \left(\eta_*^2 - \eta^2\right)^{1/3}$$

$$\eta_* = \left(\frac{1024}{243\pi^3}\right)^{1/8} \approx 0.779212$$

[1, 2]

# References


[1] I. S. Gradshteyn and I. M. Ryzhik, *Table of Integrals, Series, and Products.* Academic Press, 7 ed., 2007.

[2] D. Zwillinger, *Handbook of Differential Equations.* Academic Press, 2 ed., 1992.