Pensieve header: Tidbits.

Topics (in no particular order). Whatever you may suggest; whatever comes to my mind; ~~the Fibonacci numbers~~; ~~the Catalan numbers~~; ~~the Jones polynomial~~; ~~a more efficient Jones algorithm~~; ~~a riddle on spheres~~; Khovanov homology; Γ-calculus; the Hopf fibration; Hilbert's 13th problem; non-commutative Gaussian elimination; free Lie algebras; the Baker-Campbell-Hausdorff formula; wacky numbers; ~~an order 4 torus~~; the Schwarz Lantern; knot colourings; the Temperley-Lieb pairing; the dodecahedral link; ~~sound experiments~~; barycentric subdivisions; ~~some Peano curves~~; braid closures and Vogel's algorithm; ~~the insolubility of the quintic~~; phase portraits; the Mandelbrot set; shadows of the Cantor aerogel; quilt plots; some image transformations; De Bruijn graphs; the Riemann series theorem; finite type invariants and the Willerton fish; ~~the Towers of Hanoi~~; ~~Hochschild homology of (some) coalgebras~~; ~~convolutions and image improvements~~; the 8-5-3 milk jug problem; ~~a cow problem,~~ ~~a permutations package~~.

The 8-5-3 Milk Jug Problem

Problem. A Milk has three jugs of milk, one carrying 8 liters, one 5 liters, and one 3 liters. The 8 liter jug is full, the other two are empty. Can they measure 4 liters of milk?

Challenge. Draw the state graph of this problem (with spilling allowed and also without).

An NCGE Challenge

Update the NCGE program to contain "backtracking information". Use it to find how to turn the lower face of a Rubik's cube by turning all but the lower face of that cube.

The Package Perm

Complete the package perm, with documentation and all. For Perm[5,2,3,1,4], etc, your package should know $\sigma\circ\tau$, σ^{-1}, $\sigma[[i]]$, Pivot[σ], PermutationQ[σ], IdentityPermutation[n], it should interact well with Cycles, and its internals should be hidden. It should live in a file "Perm.m".

Quilt Plots

Often when I teach linear algebra, I like to emphasize that all smooth functions, at small scale, are linear. I often do it by displaying "quilt plots" of functions $f:\mathbb{R}^2\to\mathbb{R}^2$, and emphasizing that small rectangles get mapped to small parallelograms:

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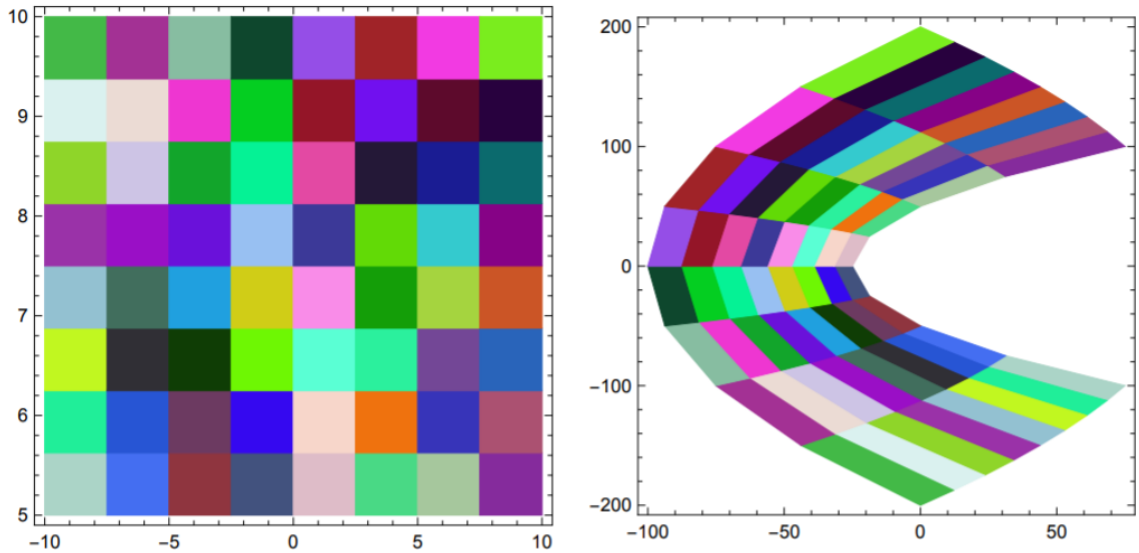
DoubleQuiltPlot[{x^2 - y^2, 2 * x * y}, {x, -10, 10, 8}, {y, 5, 10, 8}]
```



Write a sophisticated Mathematica package that implements QuiltPlot and DoubleQuiltPlot with many bells and whistles.