

## Stuck on a problem in *Applied Mathematics*?

### Have you tried ...

- ~ scaling arguments
- ! spotting a symmetry
- rotating the axes
- $\mathbf{x} \rightarrow \xi$  transforming the coordinates or variables
  - $i$  using complex variables
  - $\approx$  neglecting small terms
  - $\leqslant$  finding upper or lower bounds
  - ✓ looking for self-consistency or contradiction
  - $\varepsilon$  perturbing about equilibrium
  - $\mathcal{L}$  linearizing the problem
- $d = 1$  studying the 1D case
- $x_i \mathbf{e}_i$  expanding in a basis
- $\lim_x$  taking limits to 0 or  $\infty$
- $(\mathbf{k}, \omega)$  going to Fourier space
  - $\sum$  converting an integral to a sum
  - $\int$  converting a sum to an integral
  - $\Lambda$  cutting off the integral
- $\Delta x$  discretizing the problem
- $\nabla$  using a vector calculus identity
- $\delta$  using a Dirac delta function property
- $C$  identifying conserved or invariant quantities
- $\star$  looking for self-similarity
- $\frac{D\mathbf{u}}{Dt}$  switching between Eulerian and Lagrangian coordinates
- $\mathbf{F}$  considering physical quantities such as force, momentum or energy
- $v$  multiplying by an arbitrary test function
- $\Omega$  integrating over an arbitrary test domain
- $\mathbb{R}$  reverse-engineering a solution
- $+0$  adding zero creatively
- $\times 1$  multiplying by one creatively