abstract We present a new method to extract anisotropic flow in heavy ion collisions from the genuine correlation among a large number of particles. Anisotropic flow is obtained from the zeroes in the complex plane of a generating function of azimuthal correlations, in close analogy with the theory of phase transitions by Lee and Yang. Flow is first estimated globally, i.e., averaged over the phase space covered by the detector, and then differentially, as a function of transverse momentum and rapidity for identified particles. The corresponding estimates are less biased by nonflow correlations than with any other method. The practical implementation of the method is rather straightforward. Furthermore, it automatically takes into account most corrections due to azimuthal anisotropies in the detector acceptance. The main limitation of the method is statistical errors, which can be significantly larger than with the “standard” method of flow analysis if the flow and/or the event multiplicities are too small. In practice, we expect this to be the most accurate method to analyze directed and elliptic flow in fixed-target heavy-ion collisions between 100 MeV and 10 GeV per nucleon (at the Darmstadt SIS synchrotron and the Brookhaven Alternating Gradient Synchrotron), and elliptic flow at ultrarelativistic energies (at the Brookhaven Relativistic Heavy Ion Collider, and the forthcoming Large Hadron Collider at CERN).