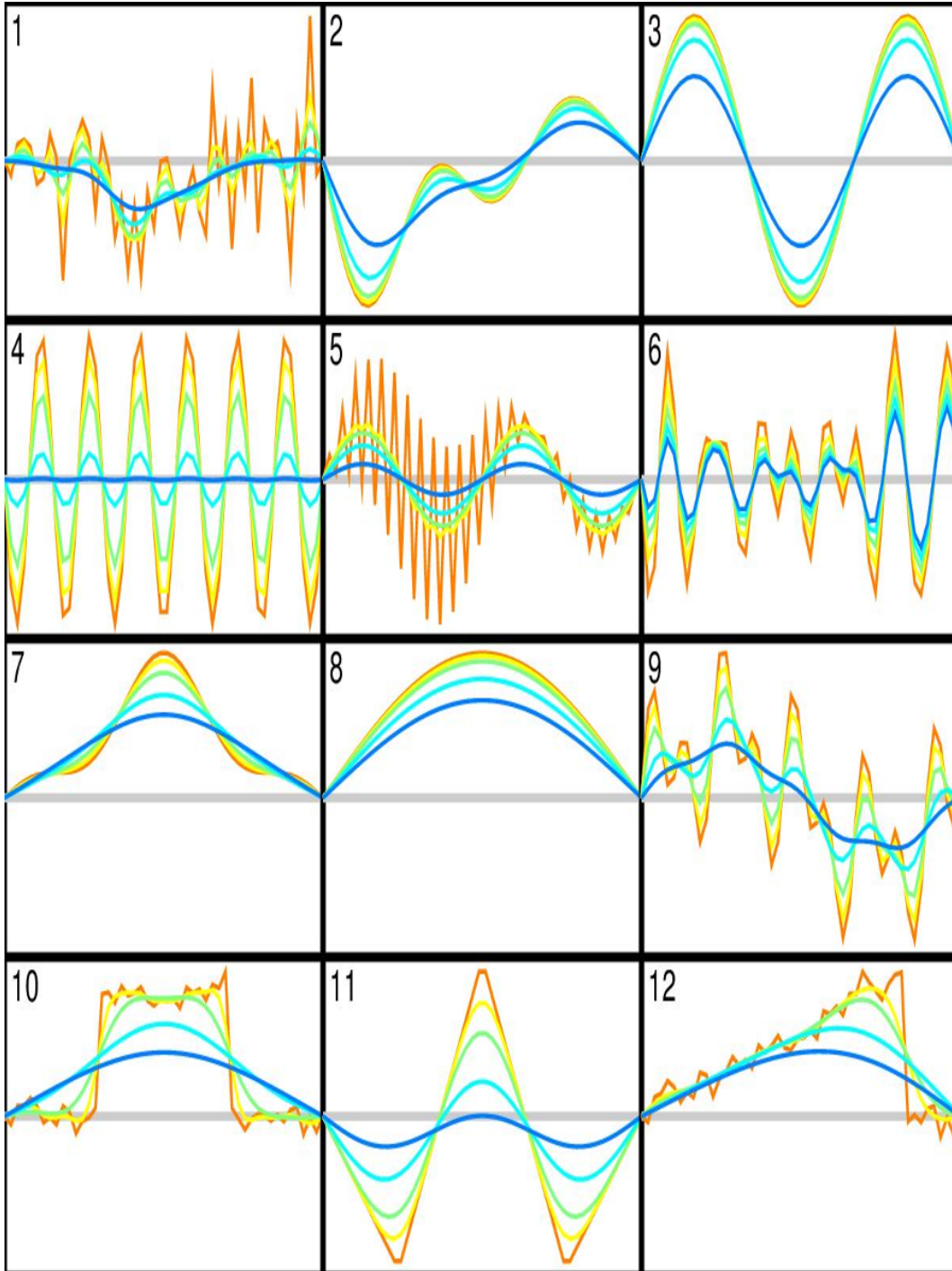


*Heat Equation for Linear Algebra Lab 1*

1. In the following picture, there are 12 different initial heat states (in orange) and their corresponding diffusions (colors varying from orange to dark blue). Group the pictures based on the diffusion behavior. Briefly list the criteria you used to group them. We will use these descriptions in the next discussion so try to be as clear as possible.



2. Write the expression for  $Eu$  for the special vectors discussed in class.
3. Now let's view the diffusion of linear combinations of these special vectors. What do you see in the diffusion of a vector that is a linear combination of
  - (a) Two of these special vectors?
  - (b) Three of these special vectors?
4. Write out algebraically what happens in the diffusion of a heat state that is a linear combination of these special vectors.
5. What if we want to find more of these special vectors? What matrix equation would we solve?
6. What do this equation and the invertible matrix theorem tell us?