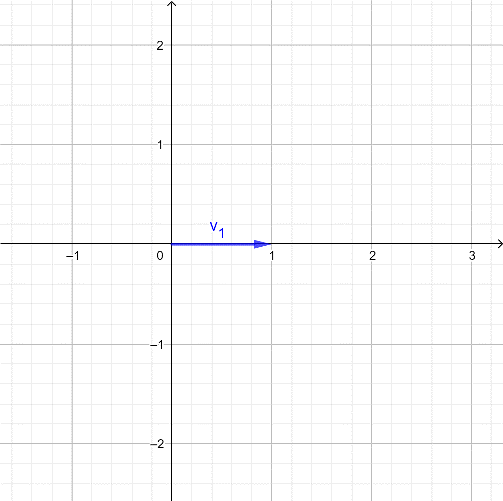
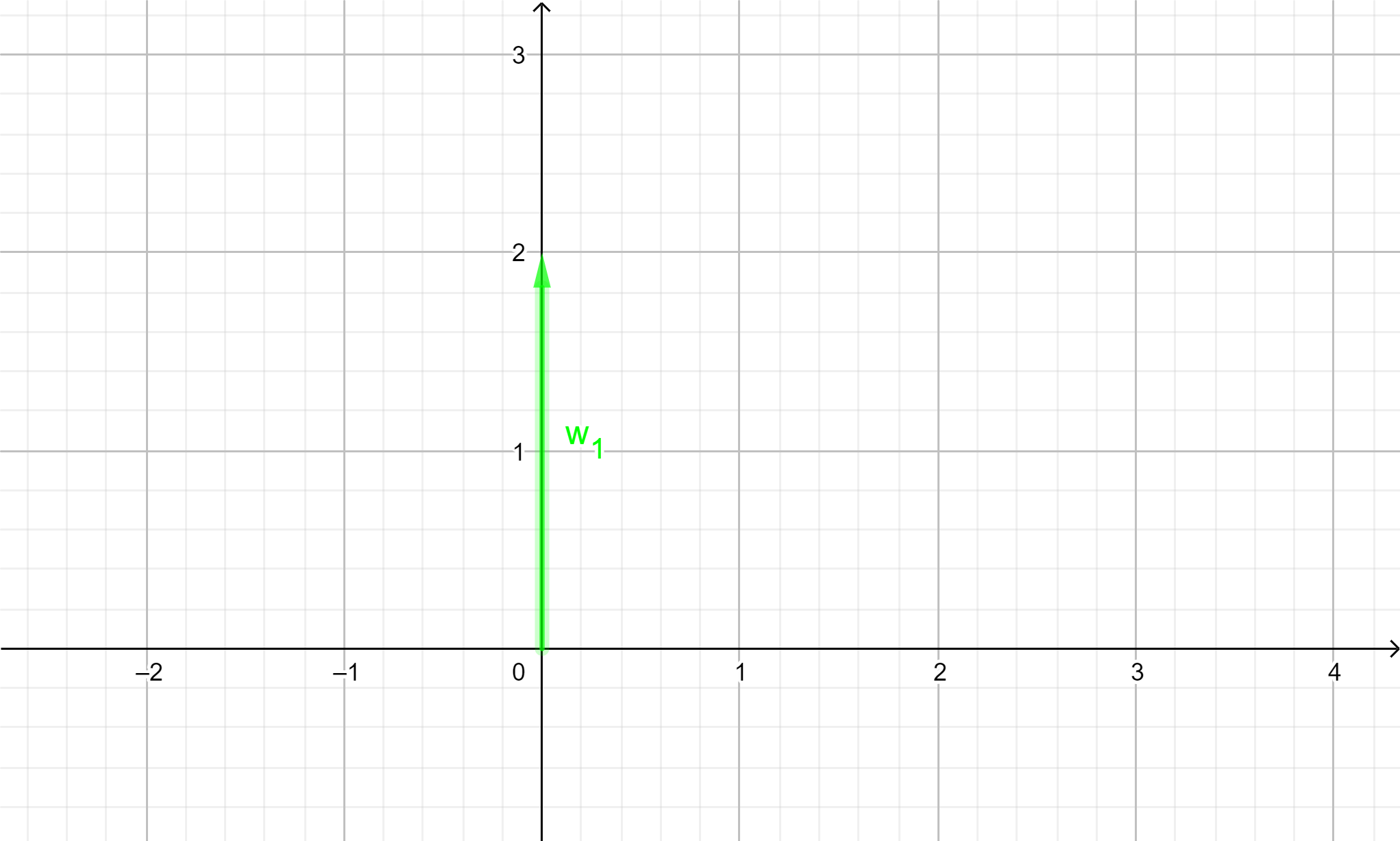
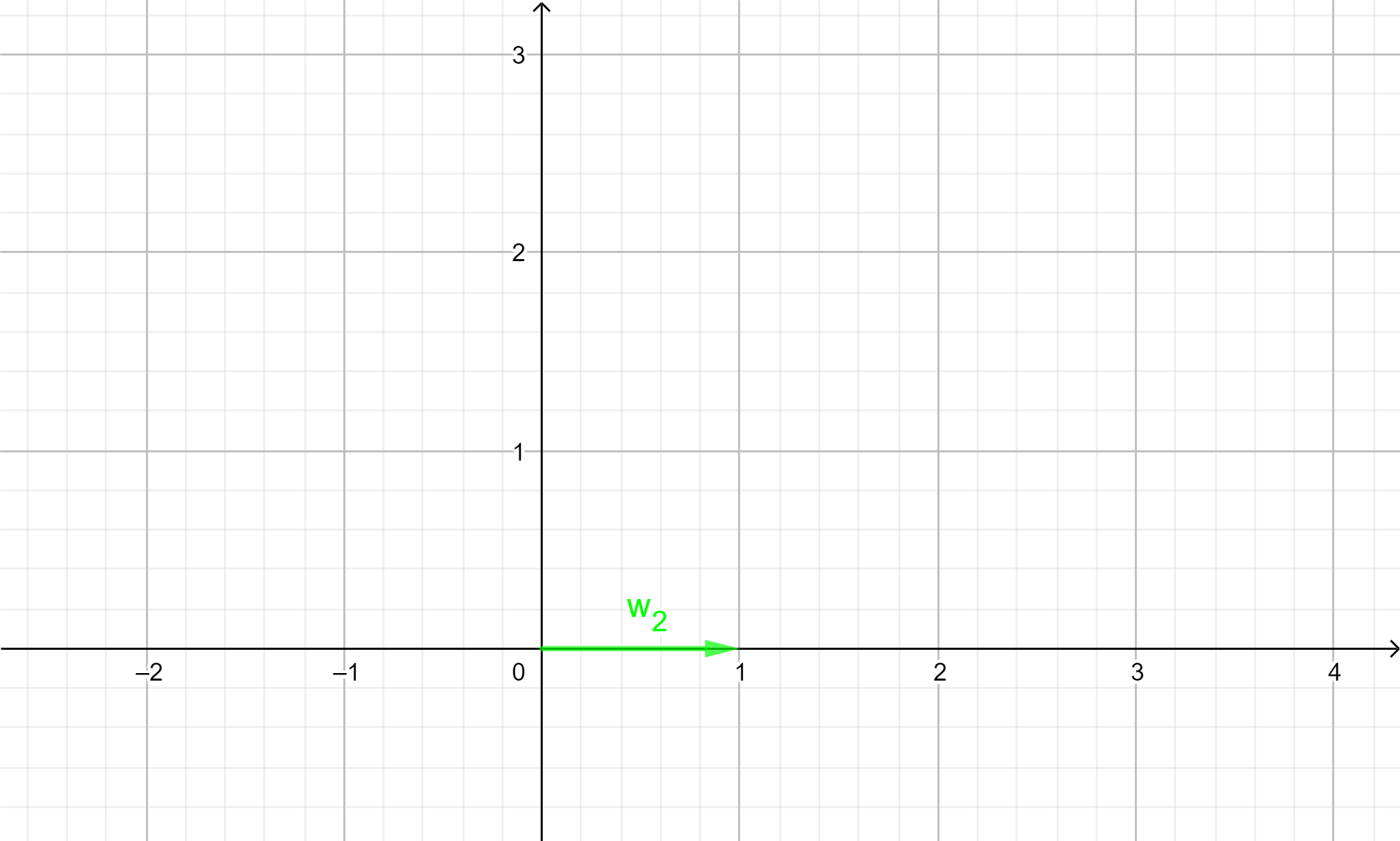
# Theme 2: Linear transformations and mappings

We have two vectors in the plane og . We call these input-vectors, or test-vectors. An unknown “machine” which we call *the linear transformation T*, maps the vectors og to new vectors og as follows:

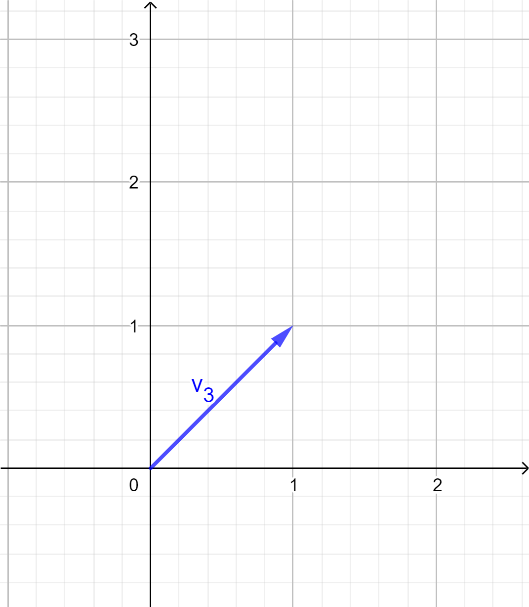
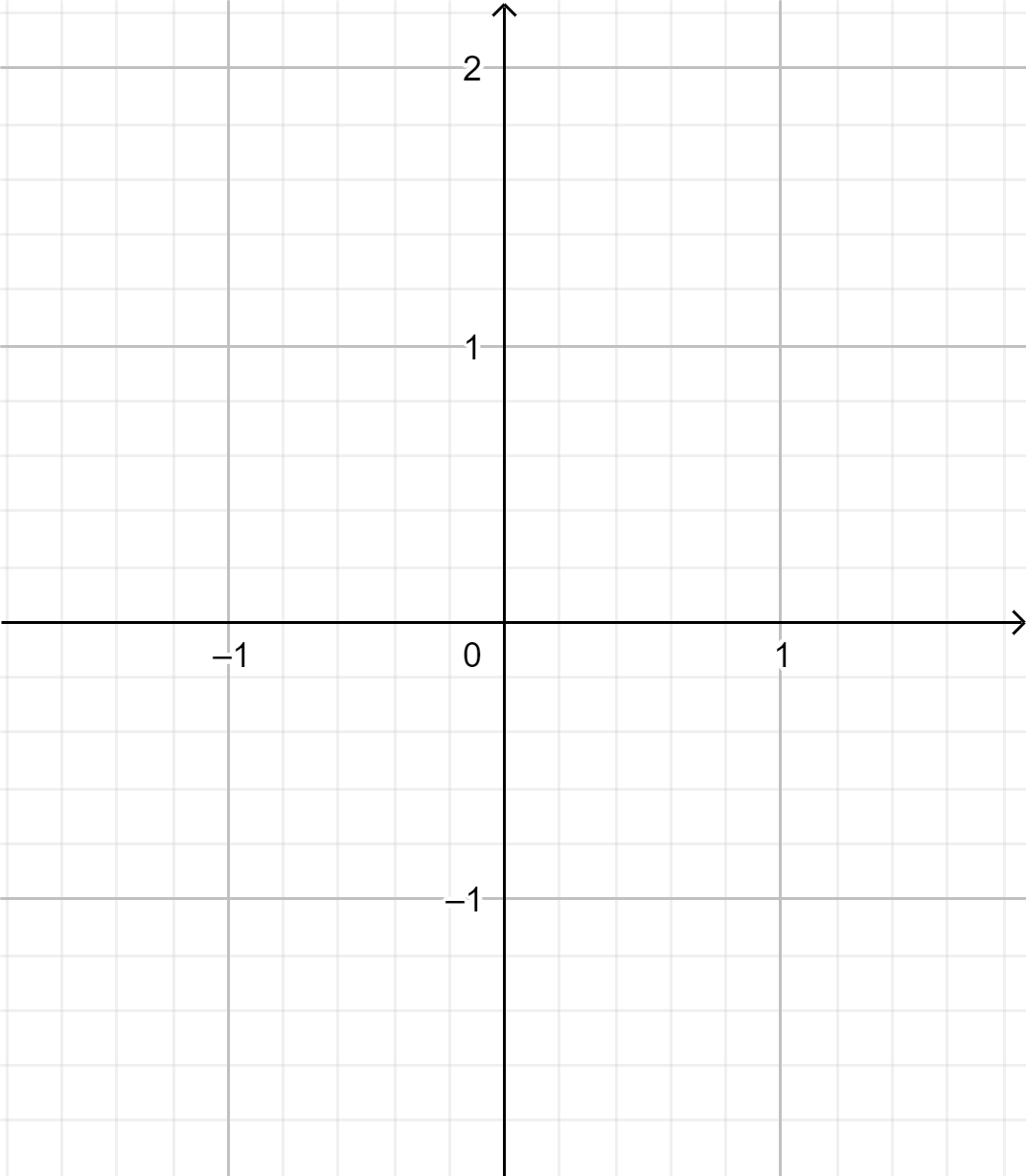




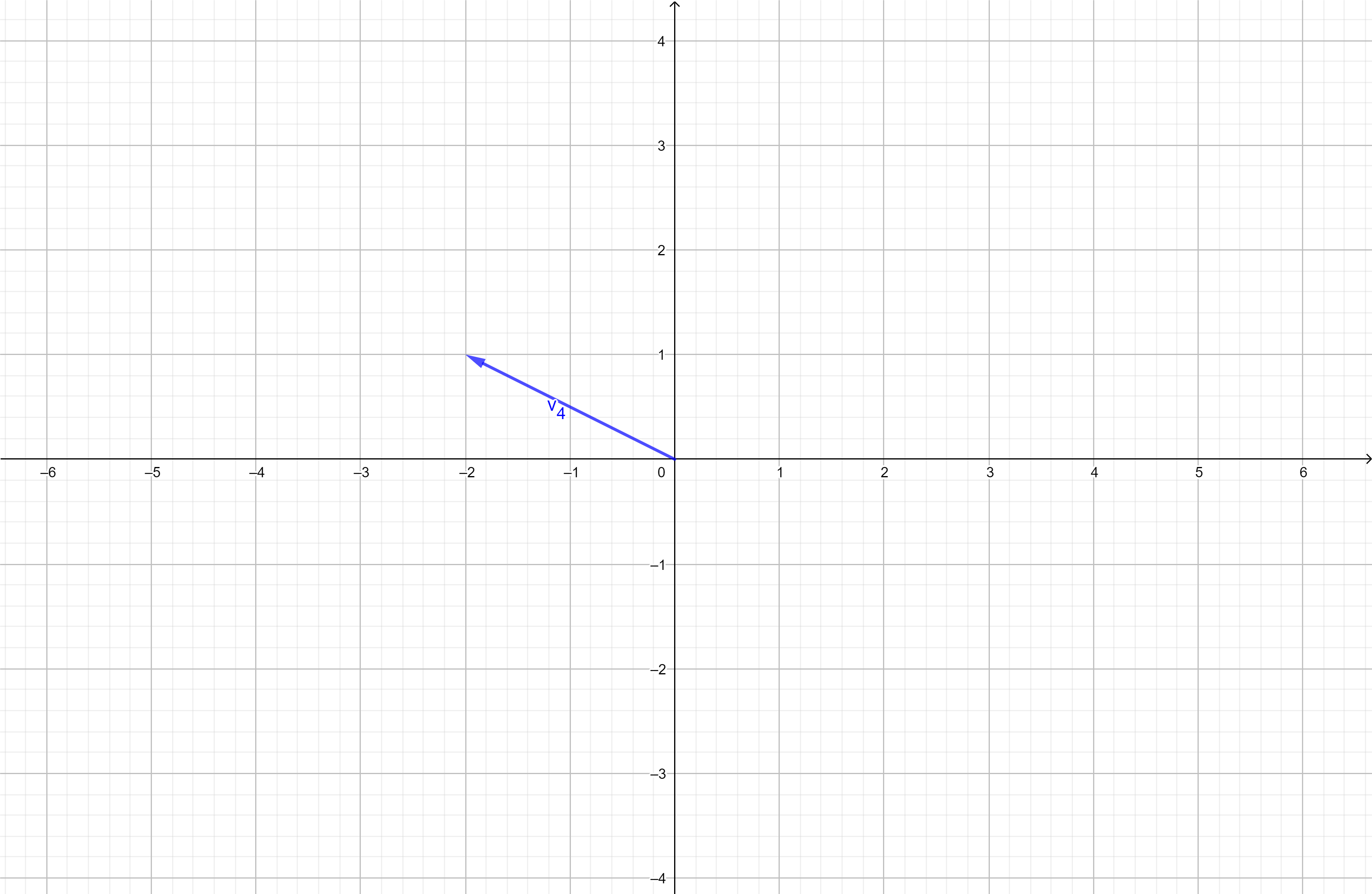
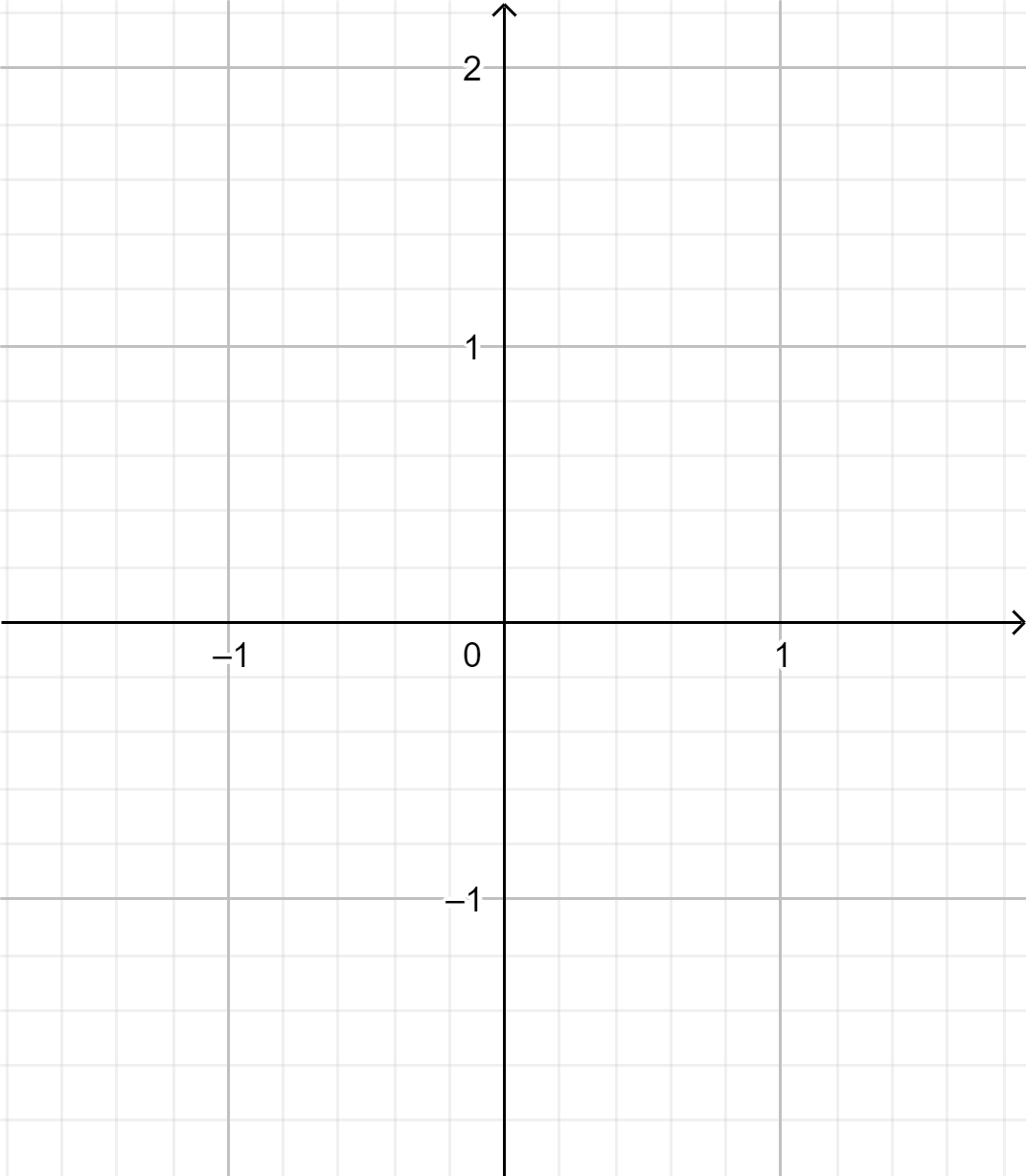
 



1. What will the transformation T do with the vectors og as described in the figures below?







1. How about a general two-dimensional vector . How will the mapping look like on such a vector?
2. If the two test vectors and was colinear/parallel, how would the mappings og relate to each other? What if the mapped vectors og was colinear, how do the test vectors and relate?
3. What would happen in 3d? How many vectors would be needed to decide the linear transformation T? How would the mathematical form of T look like?
4. What about linear mappings between different dimensions? Say between 3d and 2d? How could we visualize these? How could we examine the effect of such a transformation?
5. How many vectors would be needed to decide a linear mapping between 3d and 2d?
6. How many vectors would be needed to decide a linear mapping between 2d and 3d?
7. How would the mathematical form of these two mappings look like? What types of vectors do we need to decide ? And what types to decide ?