Source:

1 | eigenvalues

eigenvalue: multiplied by a scalar? a subspace that, when put through a linear map, only gets scaled.

$$Tv = \lambda v$$

Where $v \neq 0$. (we ignore it because its no fun to send zero to zero, and bc the span is empty).
T must be an operator! Otherwise the matrix sizes don't work out when subtracting λI.
where v is the eigenvector and λ is the eigenvalue. The equation is often rewritten as:

$$Tv - \lambda v = 0 Tv - \lambda Iv \quad = 0 (T - \lambda I)v = 0$$

now this can be factored and roots can be found. also it's an operator.

1.1 | Axler 5.6 equivalent conditions

Only when V is finite dimensional!

1.1.1 | $T - \lambda I$ is not injective, because both $v, 0$ are in the null space.

1.1.2 | $T - \lambda I$ is also not surjective or invertible bc finite dim operator.

2 | an example

3 | depends on

3.1 | finding roots is helpful