TRUE OR FALSE

1. The Segre variety $\Sigma_{1,3}$ in $\mathbb{P}^7$ has codimension three.

2. If $Gr(3, k^5) \rightarrow \mathbb{P}^2$ is a surjective regular map, then the fibers have dimension at least 4.

3. If $f : X \rightarrow Y$ be a surjective regular map of projective varieties, then the locus of points $y$ of $Y$ where the dimension of the components of $f^{-1}(y)$ is $(\dim X - \dim Y)$ is closed.

4. The locus of pairs $(X, p)$ in $\mathbb{P}(Sym^2(k^3)^*) \times \mathbb{P}^2$ consisting of a conic $X$ together with a point $p$ on $X$ forms a projective variety of dimension six.

5. The variety of $4 \times 5$ matrices of rank less than 3 has dimension 15.

6. The dimension of a variety $V$ is the same as the dimension of any non-empty open subset of $V$.

7. The set of invertible linear transformations of $\mathbb{C}^d$ can be given the structure of a variety of dimension $d$.

8. The diagonal in $\mathbb{P}^n \times \mathbb{P}^n$ has dimension $n$.

9. Every cubic surface in $\mathbb{P}^3$, even the degenerate ones, contains a line.

10. If a surjective map $X \rightarrow Y$ induces an integral extension of function fields $k(Y) \hookrightarrow k(X)$, then $f$ is finite.