

1. For those who have taken calculus: calculate the following derivative for all square matrices A :

$$\frac{d}{dx}(\det(I + xA))|_{x=0}$$

The answer is a familiar quantity associated with the matrix A .

2. (based on a suggestion from Silas Twickler) Let $A = (\vec{v}_1 \ \vec{v}_2 \ \vec{v}_3)$ with \vec{v}_1 , \vec{v}_2 , and \vec{v}_3 unknown but $\det(A) = 1$. Determine for which values of c the matrix $(c\vec{v}_1 + 2\vec{v}_2 \ \vec{v}_1 - \vec{v}_2 \ \vec{v}_2 + \vec{v}_3)$ is invertible.