Answer on Question #78515 – Math – Analytic Geometry

Question

x + y + z = 0 touches the cone x^2+y^2+z^2+2(xy+yz+zx)=0
Is the statement true? Give reason for your answer, either with a short proof or a counterexample.

Solution

$$\begin{cases} x + y + z = 0 \\ x^2+y^2+z^2+2(xy+yz+zx)=0 \end{cases}$$

If the system has only one solution, then plane touches the cone.

We have 3 variables and 2 equations. The system has more than one solution, for example,

$(x, y, z) = (0, 0, 0)$ and $(x, y, z) = (-1, 1, 0)$.

Thus, x+y+z=0 does not touch, it crosses the cone x^2+y^2+z^2+2(xy+yz+zx)=0.

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