

Solutions to the “QUIZ” for Dec. 14, 2009 (Marathon Review Session)

Which of the following answers is nonsense. Explain!

1. $\int_0^\pi \int_{-1}^1 r \cos \theta \, dr \, d\theta$ (in polar coordinates). Nonsense. The limit of integration of r can never be negative numbers, since r is **distance** from the origin, and distance is never negative.
2. $\int_0^\pi \int_0^1 \int_{-3}^3 r \cos \theta \, dz \, dr \, d\theta$ (in cylindrical coordinates). OK, the limits-of-integration for the z integration are allowed to be negative.
3. The tangent plane to the surface $z = x^2 + y^2$ at $(1, 1, 2)$ is $z = 2 + 2x(x - 1) + 2y(y - 1)$. Nonsense: the format of equation of a plane is $z = ax + by + c$ where a , b and c are numbers.
4. For some vector field \mathbf{F} , $\operatorname{div} \mathbf{F} = \langle x, y, z \rangle$. Nonsense: $\operatorname{div} \mathbf{F}$ is always a **function**, never a vector-field.
5. For some vector field \mathbf{F} , $\operatorname{curl} \mathbf{F} = \sin(x + y + z)$. Nonsense: $\operatorname{curl} \mathbf{F}$ is another vector-field, never a function.
6. The arclength of a certain curve equals -5 . Nonsense: length is never negative.
7. The volume of a certain solid body equals -11.1 . Nonsense: volume is never negative.
8. The volume-integral of a certain function over a certain solid-body equals -11.1 . OK.
9. The line-integral of a certain scalar function over a certain curve equals -7 . OK.
10. $\sin^{-1}(2)$. Nonsense: $\sin x$ is always between -1 and 1 .