

13-18 Determine whether or not the vector field is conservative. If it is conservative, find a function f such that $\mathbf{F} = \nabla f$.

13. $\mathbf{F}(x, y, z) = \langle y^2 x^3, 2xyz^3, 3xy^2 z^2 \rangle$

15. $\mathbf{F}(x, y, z) = z \cos(y)\mathbf{i} + xz \sin(y)\mathbf{j} + x \cos(y)\mathbf{k}$

17. $\mathbf{F}(x, y, z) = \langle e^{yz}, xze^{yz}, xte^{yz} \rangle$

19. Is there a vector field G on \mathbb{R}^3 such that $\text{curl } \mathbf{G} = \langle x \sin y, \cos y, z - xy \rangle$? Explain.

21. Show that any vector field of the form

$$\mathbf{F}(x, y, z) = \langle f(x), g(y), h(z) \rangle$$

where f, g, h are differentiable functions, is irrotational.