

Vector Identities

Gradient

1. $\vec{\nabla}(f + g) = \vec{\nabla}f + \vec{\nabla}g$
2. $\vec{\nabla}(cf) = c\vec{\nabla}f$, for any **constant** c
3. $\vec{\nabla}(fg) = f\vec{\nabla}g + g\vec{\nabla}f$
4. $\vec{\nabla}(f/g) = (g\vec{\nabla}f - f\vec{\nabla}g)/g^2$ at points \vec{x} where $g(\vec{x}) \neq 0$.

Divergence

5. $\vec{\nabla} \cdot (\vec{F} + \vec{G}) = \vec{\nabla} \cdot \vec{F} + \vec{\nabla} \cdot \vec{G}$
6. $\vec{\nabla} \cdot (c\vec{F}) = c\vec{\nabla} \cdot \vec{F}$, for any **constant** c
7. $\vec{\nabla} \cdot (f\vec{F}) = f\vec{\nabla} \cdot \vec{F} + \vec{F} \cdot \vec{\nabla}f$

Curl

8. $\vec{\nabla} \times (\vec{F} + \vec{G}) = \vec{\nabla} \times \vec{F} + \vec{\nabla} \times \vec{G}$
9. $\vec{\nabla} \times (c\vec{F}) = c\vec{\nabla} \times \vec{F}$, for any **constant** c
10. $\vec{\nabla} \times (f\vec{F}) = f\vec{\nabla} \times \vec{F} + \vec{\nabla}f \times \vec{F}$

Screening tests

11. $\vec{\nabla} \cdot (\vec{\nabla} \times \vec{F}) = 0$
12. $\vec{\nabla} \times (\vec{\nabla}f) = 0$