Basic Identities of Vector Analysis

$f, g : \mathbb{R}^n \to \mathbb{R}$ $\quad$ $\mathbf{F}, \mathbf{G} : \mathbb{R}^n \to \mathbb{R}^n$ $\quad$ with $n = 3$ whenever necessary

1. $\nabla(f + g) = \nabla f + \nabla g$

2. $\nabla(cf) = c\nabla f$

3. $\nabla(fg) = f\nabla g + g\nabla f$

4. $\nabla\left(\dfrac{f}{g}\right) = \dfrac{g\nabla f - f\nabla g}{g^2}, \qquad$ where $g \neq 0$

5. $\operatorname{div}(\mathbf{F} + \mathbf{G}) = \operatorname{div}\mathbf{F} + \operatorname{div}\mathbf{G}$

6. $\operatorname{curl}(\mathbf{F} + \mathbf{G}) = \operatorname{curl}\mathbf{F} + \operatorname{curl}\mathbf{G}$

7. $\operatorname{div}(f\mathbf{F}) = f\operatorname{div}\mathbf{F} + \mathbf{F} \cdot \nabla f$

8. $\operatorname{div}(\mathbf{F} \times \mathbf{G}) = \mathbf{G} \cdot \operatorname{curl}\mathbf{F} - \mathbf{F} \cdot \operatorname{curl}\mathbf{G}$

9. $\operatorname{div}\operatorname{curl}\mathbf{F} = 0$

10. $\operatorname{curl}(f\mathbf{F}) = f\operatorname{curl}\mathbf{F} + \nabla f \times \mathbf{F}$

11. $\operatorname{curl}\nabla f = \mathbf{0}$

12. $\nabla^2(fg) = f\nabla^2 g + g\nabla^2 f + 2(\nabla f \cdot \nabla g)$

13. $\operatorname{div}(\nabla f \times \nabla g) = 0$

14. $\operatorname{div}(f\nabla g - g\nabla f) = f\nabla^2 g - g\nabla^2 f$