Operator ∇ (nabla)

(01) $\nabla = [\frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z}]$

(02) $\nabla f = [\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z}]$ (gradient)

(03) $\nabla \mathbf{A} = \frac{\partial A_x}{\partial x} + \frac{\partial A_y}{\partial y} + \frac{\partial A_z}{\partial z}$ (dywergencja)

(04) $\nabla \times \mathbf{A} = [\frac{\partial A_z}{\partial y} - \frac{\partial A_y}{\partial z}, \frac{\partial A_x}{\partial z} - \frac{\partial A_z}{\partial x}, \frac{\partial A_y}{\partial x} - \frac{\partial A_x}{\partial y}]$ (rotacja)

(05) $\Delta = \nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}$ (laplasjan)

(06) $\Delta f = \frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} + \frac{\partial^2 f}{\partial z^2}$

(07) $\Delta \mathbf{A} = [\Delta A_x, \Delta A_y, \Delta A_z]$

Podstawowe własności ∇

(08) $\nabla(fg) = g\nabla f + f\nabla g$

(09) $\nabla(f\mathbf{A}) = \mathbf{A}\nabla f + f\nabla \mathbf{A}$

(10) $\nabla(\mathbf{AB}) = \mathbf{A} \times (\nabla \times \mathbf{B}) + \mathbf{B} \times (\nabla \times \mathbf{A}) + (\mathbf{A}\nabla)\mathbf{B} + (\mathbf{B}\nabla)\mathbf{A}$

(11) $\nabla(\mathbf{A} \times \mathbf{B}) = \mathbf{B}(\nabla \times \mathbf{A}) - \mathbf{A}(\nabla \times \mathbf{B})$

(12) $\nabla \times (f\mathbf{A}) = f(\nabla \times \mathbf{A}) - \mathbf{A} \times (\nabla f)$

(13) $\nabla \times (\mathbf{A} \times \mathbf{B}) = (\mathbf{B}\nabla)\mathbf{A} - (\mathbf{A}\nabla)\mathbf{B} + \mathbf{A}(\nabla \mathbf{B}) - \mathbf{B}(\nabla \mathbf{A})$

(14) $\nabla \times (\nabla \times \mathbf{A}) = \nabla(\nabla \mathbf{A}) - \Delta \mathbf{A}$

(15) $\nabla(\nabla \times \mathbf{A}) = 0$

(16) $\nabla \times (\nabla f) = 0$

Inne

(17) $\oint \mathbf{A}\ \mathrm{d}\mathbf{a} = \int \nabla \mathbf{A}\ \mathrm{d}\tau$ (twierdzenie Gaussa)

(18) $\oint \mathbf{A}\ \mathrm{d}\mathbf{l} = \int \nabla \times \mathbf{A}\ \mathrm{d}\mathbf{a}$ (twierdzenie Stokesa)