3D Orthogonal Metric

Multvectors:

$s = s$

$v = v^{x}\boldsymbol{e}_{x} + v^{y}\boldsymbol{e}_{y} + v^{z}\boldsymbol{e}_{z}$

$b = b^{xy}\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + b^{xz}\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + b^{yz}\boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

Products:

$ss = s^{2}$

$s\wedge s = s^{2}$

$s\lfloor s = s^{2}$

$s\rfloor s = s^{2}$

$sv = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$

$s\wedge v = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$

$s\lfloor v = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$

$s\rfloor v = 0$

$sb = b^{xy}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$s\wedge b = b^{xy}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$s\lfloor b = b^{xy}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$s\rfloor b = 0$

$vs = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$

$v\wedge s = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$

$v\lfloor s = 0$

$v\rfloor s = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$

$vv = (v^{x})^{2} + (v^{y})^{2} + (v^{z})^{2}$

$v\wedge v = 0$

$v\cdot v = (v^{x})^{2} + (v^{y})^{2} + (v^{z})^{2}$

$v\lfloor v = (v^{x})^{2} + (v^{y})^{2} + (v^{z})^{2}$

$v\rfloor v = (v^{x})^{2} + (v^{y})^{2} + (v^{z})^{2}$

$vb = \left(-b^{xy}v^{y} - b^{xz}v^{z}\right)\boldsymbol{e}_{x} + \left(b^{xy}v^{x} - b^{yz}v^{z}\right)\boldsymbol{e}_{y} + \left(b^{xz}v^{x} + b^{yz}v^{y}\right)\boldsymbol{e}_{z} + \left(b^{xy}v^{z} - b^{xz}v^{y} + b^{yz}v^{x}\right)\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$v\wedge b = \left(b^{xy}v^{z} - b^{xz}v^{y} + b^{yz}v^{x}\right)\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$v\cdot b = \left(-b^{xy}v^{y} - b^{xz}v^{z}\right)\boldsymbol{e}_{x} + \left(b^{xy}v^{x} - b^{yz}v^{z}\right)\boldsymbol{e}_{y} + \left(b^{xz}v^{x} + b^{yz}v^{y}\right)\boldsymbol{e}_{z}$

$v\lfloor b = \left(-b^{xy}v^{y} - b^{xz}v^{z}\right)\boldsymbol{e}_{x} + \left(b^{xy}v^{x} - b^{yz}v^{z}\right)\boldsymbol{e}_{y} + \left(b^{xz}v^{x} + b^{yz}v^{y}\right)\boldsymbol{e}_{z}$

$v\rfloor b = 0$

$bs = b^{xy}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$b\wedge s = b^{xy}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$b\lfloor s = 0$

$b\rfloor s = b^{xy}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$bv = \left(b^{xy}v^{y} + b^{xz}v^{z}\right)\boldsymbol{e}_{x} + \left(-b^{xy}v^{x} + b^{yz}v^{z}\right)\boldsymbol{e}_{y} + \left(-b^{xz}v^{x} - b^{yz}v^{y}\right)\boldsymbol{e}_{z} + \left(b^{xy}v^{z} - b^{xz}v^{y} + b^{yz}v^{x}\right)\boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$b \wedge v = \left (b^{xy} v^{z} - b^{xz} v^{y} + b^{yz} v^{x}\right) \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$b \cdot v = \left (b^{xy} v^{y} + b^{xz} v^{z}\right) \boldsymbol{e}_{x} + \left (- b^{xy} v^{x} + b^{yz} v^{z}\right) \boldsymbol{e}_{y} + \left (- b^{xz} v^{x} - b^{yz} v^{y}\right) \boldsymbol{e}_{z}$

$b \rfloor v = 0$

$b \lfloor v = \left (b^{xy} v^{y} + b^{xz} v^{z}\right) \boldsymbol{e}_{x} + \left (- b^{xy} v^{x} + b^{yz} v^{z}\right) \boldsymbol{e}_{y} + \left (- b^{xz} v^{x} - b^{yz} v^{y}\right) \boldsymbol{e}_{z}$

$b b = - {\left (b^{xy} \right)}^{2} - {\left (b^{xz} \right)}^{2} - {\left (b^{yz} \right)}^{2}$

$b \wedge b = 0$

$b \cdot b = - {\left (b^{xy} \right)}^{2} - {\left (b^{xz} \right)}^{2} - {\left (b^{yz} \right)}^{2}$

$b \rfloor b = - {\left (b^{xy} \right)}^{2} - {\left (b^{xz} \right)}^{2} - {\left (b^{yz} \right)}^{2}$

$b \lfloor b = - {\left (b^{xy} \right)}^{2} - {\left (b^{xz} \right)}^{2} - {\left (b^{yz} \right)}^{2}$

Multivector Functions:

$s(X) = s$

$v(X) = v^{x} \boldsymbol{e}_{x} + v^{y} \boldsymbol{e}_{y} + v^{z} \boldsymbol{e}_{z}$

$b(X) = b^{xy} \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + b^{xz} \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + b^{yz} \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

Products:

$\nabla s = \partial_{x} s \boldsymbol{e}_{x} + \partial_{y} s \boldsymbol{e}_{y} + \partial_{z} s \boldsymbol{e}_{z}$

$\nabla \wedge s = \partial_{x} s \boldsymbol{e}_{x} + \partial_{y} s \boldsymbol{e}_{y} + \partial_{z} s \boldsymbol{e}_{z}$

$\nabla \rfloor s = 0$

$\nabla \lfloor s = \partial_{x} s \boldsymbol{e}_{x} + \partial_{y} s \boldsymbol{e}_{y} + \partial_{z} s \boldsymbol{e}_{z}$

$\nabla v = \left (\partial_{x} v^{x} + \partial_{y} v^{y} + \partial_{z} v^{z} \right) + \left (- \partial_{y} v^{x} + \partial_{x} v^{y} \right) \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + \left (- \partial_{z} v^{x} + \partial_{x} v^{z} \right) \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + \left (- \partial_{z} v^{y} + \partial_{y} v^{z} \right) \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$\nabla \wedge v = \left (- \partial_{y} v^{x} + \partial_{x} v^{y} \right) \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + \left (- \partial_{z} v^{x} + \partial_{x} v^{z} \right) \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + \left (- \partial_{z} v^{y} + \partial_{y} v^{z} \right) \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$\nabla \cdot v = \partial_{x} v^{x} + \partial_{y} v^{y} + \partial_{z} v^{z}$

$\nabla \rfloor v = \partial_{x} v^{x} + \partial_{y} v^{y} + \partial_{z} v^{z}$

$\nabla \lfloor v = \partial_{x} v^{x} + \partial_{y} v^{y} + \partial_{z} v^{z}$

$\nabla b = \left (- \partial_{y} b^{xy} - \partial_{z} b^{xz} \right) \boldsymbol{e}_{x} + \left (\partial_{x} b^{xy} - \partial_{z} b^{yz} \right) \boldsymbol{e}_{y} + \left (\partial_{x} b^{xz} + \partial_{y} b^{yz} \right) \boldsymbol{e}_{z} + \left (\partial_{z} b^{xy} - \partial_{y} b^{xz} + \partial_{x} b^{yz} \right) \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$\nabla \wedge b = \left (\partial_{z} b^{xy} - \partial_{y} b^{xz} + \partial_{x} b^{yz} \right) \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$\nabla \cdot b = \left (- \partial_{y} b^{xy} - \partial_{z} b^{xz} \right) \boldsymbol{e}_{x} + \left (\partial_{x} b^{xy} - \partial_{z} b^{yz} \right) \boldsymbol{e}_{y} + \left (\partial_{x} b^{xz} + \partial_{y} b^{yz} \right) \boldsymbol{e}_{z}$

$\nabla \rfloor b = \left (- \partial_{y} b^{xy} - \partial_{z} b^{xz} \right) \boldsymbol{e}_{x} + \left (\partial_{x} b^{xy} - \partial_{z} b^{yz} \right) \boldsymbol{e}_{y} + \left (\partial_{x} b^{xz} + \partial_{y} b^{yz} \right) \boldsymbol{e}_{z}$

$\nabla \lfloor b = 0$

$s \nabla = \boldsymbol{e}_{x} s \frac{\partial}{\partial x} + \boldsymbol{e}_{y} s \frac{\partial}{\partial y} + \boldsymbol{e}_{z} s \frac{\partial}{\partial z}$

$s \wedge \nabla = \boldsymbol{e}_{x} s \frac{\partial}{\partial x} + \boldsymbol{e}_{y} s \frac{\partial}{\partial y} + \boldsymbol{e}_{z} s \frac{\partial}{\partial z}$

$s \rfloor \nabla = \boldsymbol{e}_{x} s \frac{\partial}{\partial x} + \boldsymbol{e}_{y} s \frac{\partial}{\partial y} + \boldsymbol{e}_{z} s \frac{\partial}{\partial z}$

$s \lfloor \nabla =$

$s s = s^{2}$

$s \wedge s = s^{2}$

$s \rfloor s = s^{2}$

$s \lfloor s = s^{2}$

$s v = s v^{x} \boldsymbol{e}_{x} + s v^{y} \boldsymbol{e}_{y} + s v^{z} \boldsymbol{e}_{z}$

$$s \wedge v = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$$
$$s \rfloor v = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$$
$$s \lfloor v = 0$$
$$sb = b^{xy}s\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}$$
$$s \wedge b = b^{xy}s\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}$$
$$s \rfloor b = b^{xy}s\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}$$
$$s \lfloor b = 0$$

$$v\nabla = v^{x}\frac{\partial}{\partial x} + v^{y}\frac{\partial}{\partial y} + v^{z}\frac{\partial}{\partial z} + \boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y}\left(-v^{y}\frac{\partial}{\partial x} + v^{x}\frac{\partial}{\partial y}\right) + \boldsymbol{e}_{x} \wedge \boldsymbol{e}_{z}\left(-v^{z}\frac{\partial}{\partial x} + v^{x}\frac{\partial}{\partial z}\right) + \boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}\left(-v^{z}\frac{\partial}{\partial y} + v^{y}\frac{\partial}{\partial z}\right)$$
$$v \wedge \nabla = \boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y}\left(-v^{y}\frac{\partial}{\partial x} + v^{x}\frac{\partial}{\partial y}\right) + \boldsymbol{e}_{x} \wedge \boldsymbol{e}_{z}\left(-v^{z}\frac{\partial}{\partial x} + v^{x}\frac{\partial}{\partial z}\right) + \boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}\left(-v^{z}\frac{\partial}{\partial y} + v^{y}\frac{\partial}{\partial z}\right)$$
$$v \cdot \nabla = v^{x}\frac{\partial}{\partial x} + v^{y}\frac{\partial}{\partial y} + v^{z}\frac{\partial}{\partial z}$$
$$v \rfloor \nabla = v^{x}\frac{\partial}{\partial x} + v^{y}\frac{\partial}{\partial y} + v^{z}\frac{\partial}{\partial z}$$
$$v \lfloor \nabla = v^{x}\frac{\partial}{\partial x} + v^{y}\frac{\partial}{\partial y} + v^{z}\frac{\partial}{\partial z}$$
$$vs = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$$
$$v \wedge s = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$$
$$v \rfloor s = 0$$
$$v \lfloor s = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y} + sv^{z}\boldsymbol{e}_{z}$$
$$vv = v^{x2} + v^{y2} + v^{z2}$$
$$v \wedge v = 0$$
$$v \cdot v = v^{x2} + v^{y2} + v^{z2}$$
$$v \rfloor v = v^{x2} + v^{y2} + v^{z2}$$
$$v \lfloor v = v^{x2} + v^{y2} + v^{z2}$$
$$vb = \left(-b^{xy}v^{y} - b^{xz}v^{z}\right)\boldsymbol{e}_{x} + \left(b^{xy}v^{x} - b^{yz}v^{z}\right)\boldsymbol{e}_{y} + \left(b^{xz}v^{x} + b^{yz}v^{y}\right)\boldsymbol{e}_{z} + \left(b^{xy}v^{z} - b^{xz}v^{y} + b^{yz}v^{x}\right)\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}$$
$$v \wedge b = \left(b^{xy}v^{z} - b^{xz}v^{y} + b^{yz}v^{x}\right)\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}$$
$$v \cdot b = \left(-b^{xy}v^{y} - b^{xz}v^{z}\right)\boldsymbol{e}_{x} + \left(b^{xy}v^{x} - b^{yz}v^{z}\right)\boldsymbol{e}_{y} + \left(b^{xz}v^{x} + b^{yz}v^{y}\right)\boldsymbol{e}_{z}$$
$$v \rfloor b = \left(-b^{xy}v^{y} - b^{xz}v^{z}\right)\boldsymbol{e}_{x} + \left(b^{xy}v^{x} - b^{yz}v^{z}\right)\boldsymbol{e}_{y} + \left(b^{xz}v^{x} + b^{yz}v^{y}\right)\boldsymbol{e}_{z}$$
$$v \lfloor b = 0$$

$$b\nabla = \boldsymbol{e}_{x}\left(b^{xy}\frac{\partial}{\partial y} + b^{xz}\frac{\partial}{\partial z}\right) + \boldsymbol{e}_{y}\left(-b^{xy}\frac{\partial}{\partial x} + b^{yz}\frac{\partial}{\partial z}\right) + \boldsymbol{e}_{z}\left(-b^{xz}\frac{\partial}{\partial x} - b^{yz}\frac{\partial}{\partial y}\right) + \boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}\left(b^{yz}\frac{\partial}{\partial x} - b^{xz}\frac{\partial}{\partial y} + b^{xy}\frac{\partial}{\partial z}\right)$$
$$b \wedge \nabla = \boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}\left(b^{yz}\frac{\partial}{\partial x} - b^{xz}\frac{\partial}{\partial y} + b^{xy}\frac{\partial}{\partial z}\right)$$
$$b \cdot \nabla = \boldsymbol{e}_{x}\left(b^{xy}\frac{\partial}{\partial y} + b^{xz}\frac{\partial}{\partial z}\right) + \boldsymbol{e}_{y}\left(-b^{xy}\frac{\partial}{\partial x} + b^{yz}\frac{\partial}{\partial z}\right) + \boldsymbol{e}_{z}\left(-b^{xz}\frac{\partial}{\partial x} - b^{yz}\frac{\partial}{\partial y}\right)$$
$$b \rfloor \nabla =$$
$$b \lfloor \nabla = \boldsymbol{e}_{x}\left(b^{xy}\frac{\partial}{\partial y} + b^{xz}\frac{\partial}{\partial z}\right) + \boldsymbol{e}_{y}\left(-b^{xy}\frac{\partial}{\partial x} + b^{yz}\frac{\partial}{\partial z}\right) + \boldsymbol{e}_{z}\left(-b^{xz}\frac{\partial}{\partial x} - b^{yz}\frac{\partial}{\partial y}\right)$$
$$bs = b^{xy}s\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}$$
$$b \wedge s = b^{xy}s\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y} + b^{xz}s\boldsymbol{e}_{x} \wedge \boldsymbol{e}_{z} + b^{yz}s\boldsymbol{e}_{y} \wedge \boldsymbol{e}_{z}$$

$b\lfloor s = 0$

$b\rfloor s = b^{xy} s \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y} + b^{xz} s \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{z} + b^{yz} s \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$b v = \left (b^{xy} v^{y} + b^{xz} v^{z}\right) \boldsymbol{e}_{x} + \left (- b^{xy} v^{x} + b^{yz} v^{z}\right) \boldsymbol{e}_{y} + \left (- b^{xz} v^{x} - b^{yz} v^{y}\right) \boldsymbol{e}_{z} + \left (b^{xy} v^{z} - b^{xz} v^{y} + b^{yz} v^{x}\right) \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$b\wedge v = \left (b^{xy} v^{z} - b^{xz} v^{y} + b^{yz} v^{x}\right) \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}\wedge \boldsymbol{e}_{z}$

$b\cdot v = \left (b^{xy} v^{y} + b^{xz} v^{z}\right) \boldsymbol{e}_{x} + \left (- b^{xy} v^{x} + b^{yz} v^{z}\right) \boldsymbol{e}_{y} + \left (- b^{xz} v^{x} - b^{yz} v^{y}\right) \boldsymbol{e}_{z}$

$b\lfloor v = 0$

$b\rfloor v = \left (b^{xy} v^{y} + b^{xz} v^{z}\right) \boldsymbol{e}_{x} + \left (- b^{xy} v^{x} + b^{yz} v^{z}\right) \boldsymbol{e}_{y} + \left (- b^{xz} v^{x} - b^{yz} v^{y}\right) \boldsymbol{e}_{z}$

$b b = - b^{xy 2} - b^{xz 2} - b^{yz 2}$

$b\wedge b = 0$

$b\cdot b = - b^{xy 2} - b^{xz 2} - b^{yz 2}$

$b\lfloor b = - b^{xy 2} - b^{xz 2} - b^{yz 2}$

$b\rfloor b = - b^{xy 2} - b^{xz 2} - b^{yz 2}$

General 2D Metric

Multivector Functions:

$s(X) = s$

$v(X) = v^{x} \boldsymbol{e}_{x} + v^{y} \boldsymbol{e}_{y}$

$b(X) = v^{xy} \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}$

Products:

$$\nabla s = \frac{- \left(e_{x}\cdot e_{y}\right) \partial_{y} s + \left(e_{y}\cdot e_{y}\right) \partial_{x} s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \boldsymbol{e}_{x} + \frac{\left(e_{x}\cdot e_{x}\right) \partial_{y} s - \left(e_{x}\cdot e_{y}\right) \partial_{x} s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \boldsymbol{e}_{y}$$

$$\nabla \wedge s = \frac{- \left(e_{x}\cdot e_{y}\right) \partial_{y} s + \left(e_{y}\cdot e_{y}\right) \partial_{x} s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \boldsymbol{e}_{x} + \frac{\left(e_{x}\cdot e_{x}\right) \partial_{y} s - \left(e_{x}\cdot e_{y}\right) \partial_{x} s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \boldsymbol{e}_{y}$$

$\nabla \cdot s = Not Allowed$

$\nabla \lfloor s = 0$

$$\nabla \rfloor s = \frac{- \left(e_{x}\cdot e_{y}\right) \partial_{y} s + \left(e_{y}\cdot e_{y}\right) \partial_{x} s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \boldsymbol{e}_{x} + \frac{\left(e_{x}\cdot e_{x}\right) \partial_{y} s - \left(e_{x}\cdot e_{y}\right) \partial_{x} s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \boldsymbol{e}_{y}$$

$$\nabla v = \left (\partial_{x} v^{x} + \partial_{y} v^{y}\right) + \frac{- \left(e_{x}\cdot e_{x}\right) \partial_{y} v^{x} + \left(e_{x}\cdot e_{y}\right) \partial_{x} v^{x} - \left(e_{x}\cdot e_{y}\right) \partial_{y} v^{y} + \left(e_{y}\cdot e_{y}\right) \partial_{x} v^{y}}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}$$

$$\nabla \wedge v = \frac{- \left(e_{x}\cdot e_{x}\right) \partial_{y} v^{x} + \left(e_{x}\cdot e_{y}\right) \partial_{x} v^{x} - \left(e_{x}\cdot e_{y}\right) \partial_{y} v^{y} + \left(e_{y}\cdot e_{y}\right) \partial_{x} v^{y}}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \boldsymbol{e}_{x}\wedge \boldsymbol{e}_{y}$$

$\nabla \cdot v = \partial_{x} v^{x} + \partial_{y} v^{y}$

$\nabla \lfloor v = \partial_{x} v^{x} + \partial_{y} v^{y}$

$\nabla \rfloor v = \partial_{x} v^{x} + \partial_{y} v^{y}$

$$s\nabla = \boldsymbol{e}_{x} \left (\frac{\left(e_{y}\cdot e_{y}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial x} - \frac{\left(e_{x}\cdot e_{y}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial y}\right) + \boldsymbol{e}_{y} \left (- \frac{\left(e_{x}\cdot e_{y}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial x} + \frac{\left(e_{x}\cdot e_{x}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial y}\right)$$

$$s\wedge \nabla = \boldsymbol{e}_{x} \left (\frac{\left(e_{y}\cdot e_{y}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial x} - \frac{\left(e_{x}\cdot e_{y}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial y}\right) + \boldsymbol{e}_{y} \left (- \frac{\left(e_{x}\cdot e_{y}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial x} + \frac{\left(e_{x}\cdot e_{x}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial y}\right)$$

$s\cdot \nabla = Not Allowed$

$$s\lfloor \nabla = \boldsymbol{e}_{x} \left (\frac{\left(e_{y}\cdot e_{y}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial x} - \frac{\left(e_{x}\cdot e_{y}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial y}\right) + \boldsymbol{e}_{y} \left (- \frac{\left(e_{x}\cdot e_{y}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial x} + \frac{\left(e_{x}\cdot e_{x}\right) s}{\left(e_{x}\cdot e_{x}\right) \left(e_{y}\cdot e_{y}\right) - \left(e_{x}\cdot e_{y}\right)^{2}} \frac{\partial}{\partial y}\right)$$

$s\rfloor \nabla =$

$$ss = s^{2}$$
$$s \wedge s = s^{2}$$
$$s \cdot s = NotAllowed$$
$$s \rfloor s = s^{2}$$
$$s \lfloor s = s^{2}$$
$$sv = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y}$$
$$s \wedge v = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y}$$
$$s \cdot v = NotAllowed$$
$$s \rfloor v = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y}$$
$$s \lfloor v = 0$$

$$v\nabla = v^{x}\frac{\partial}{\partial x} + v^{y}\frac{\partial}{\partial y} + \boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y}\left(-\frac{(e_{x} \cdot e_{y})\, v^{x} + (e_{y} \cdot e_{y})\, v^{y}}{(e_{x} \cdot e_{x})\,(e_{y} \cdot e_{y}) - (e_{x} \cdot e_{y})^{2}}\frac{\partial}{\partial x} + \frac{(e_{x} \cdot e_{x})\, v^{x} + (e_{x} \cdot e_{y})\, v^{y}}{(e_{x} \cdot e_{x})\,(e_{y} \cdot e_{y}) - (e_{x} \cdot e_{y})^{2}}\frac{\partial}{\partial y}\right)$$
$$v \wedge \nabla = \boldsymbol{e}_{x} \wedge \boldsymbol{e}_{y}\left(-\frac{(e_{x} \cdot e_{y})\, v^{x} + (e_{y} \cdot e_{y})\, v^{y}}{(e_{x} \cdot e_{x})\,(e_{y} \cdot e_{y}) - (e_{x} \cdot e_{y})^{2}}\frac{\partial}{\partial x} + \frac{(e_{x} \cdot e_{x})\, v^{x} + (e_{x} \cdot e_{y})\, v^{y}}{(e_{x} \cdot e_{x})\,(e_{y} \cdot e_{y}) - (e_{x} \cdot e_{y})^{2}}\frac{\partial}{\partial y}\right)$$
$$v \cdot \nabla = v^{x}\frac{\partial}{\partial x} + v^{y}\frac{\partial}{\partial y}$$
$$v \rfloor \nabla = v^{x}\frac{\partial}{\partial x} + v^{y}\frac{\partial}{\partial y}$$
$$v \lfloor \nabla = v^{x}\frac{\partial}{\partial x} + v^{y}\frac{\partial}{\partial y}$$
$$vs = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y}$$
$$v \wedge s = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y}$$
$$v \cdot s = NotAllowed$$
$$v \rfloor s = 0$$
$$v \lfloor s = sv^{x}\boldsymbol{e}_{x} + sv^{y}\boldsymbol{e}_{y}$$
$$vv = (e_{x} \cdot e_{x})\, v^{x2} + 2\,(e_{x} \cdot e_{y})\, v^{x}v^{y} + (e_{y} \cdot e_{y})\, v^{y2}$$
$$v \wedge v = 0$$
$$v \cdot v = (e_{x} \cdot e_{x})\, v^{x2} + 2\,(e_{x} \cdot e_{y})\, v^{x}v^{y} + (e_{y} \cdot e_{y})\, v^{y2}$$
$$v \rfloor v = (e_{x} \cdot e_{x})\, v^{x2} + 2\,(e_{x} \cdot e_{y})\, v^{x}v^{y} + (e_{y} \cdot e_{y})\, v^{y2}$$
$$v \lfloor v = (e_{x} \cdot e_{x})\, v^{x2} + 2\,(e_{x} \cdot e_{y})\, v^{x}v^{y} + (e_{y} \cdot e_{y})\, v^{y2}$$