$$f = (2xy + 2)\,\boldsymbol{e_1} + ((xy + 1)\sin(y))\,\boldsymbol{e_2} + ((xy + 1)\sin(x)\cos(y))\,\boldsymbol{e_1} \wedge \boldsymbol{e_2}$$

$$\boldsymbol{\nabla}f = xy\cos(y) + x\sin(y) + 2y + \cos(y) + ((xy\sin(y) - x\cos(y) + \sin(y))\sin(x))\,\boldsymbol{e_1} + ((xy\cos(x) + y\sin(x) + \cos(x))\cos(y))\,\boldsymbol{e_2} + (-2x + y\sin(y))\,\boldsymbol{e_1} \wedge \boldsymbol{e_2}$$

$$f = 1 + xy^2\boldsymbol{e_1} + \sin(y)\boldsymbol{e_2} + \sin(x)\cos(y)\boldsymbol{e_1} \wedge \boldsymbol{e_2}$$

$$\boldsymbol{\nabla}f = y^2 + \cos(y) + \sin(x)\sin(y)\boldsymbol{e_1} + \cos(x)\cos(y)\boldsymbol{e_2} - 2xy\boldsymbol{e_1} \wedge \boldsymbol{e_2}$$

$$\boldsymbol{\nabla} \cdot f = y^2 + \cos(y) + \sin(x)\sin(y)\boldsymbol{e_1} + \cos(x)\cos(y)\boldsymbol{e_2}$$

$$\boldsymbol{\nabla} \wedge f = -2xy\boldsymbol{e_1} \wedge \boldsymbol{e_2}$$